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The Physiotherapy Review

Volume 16 Number 3

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Body Mechanics in the Treatment of Chronic Arthritis

John G. Kuhns, M. D.

When we are able to find and remove all of the causes of chronic arthritis then we can formulate a satisfactory program for the prevention and cure of this most serious of crippling diseases.[1] Until that time we shall continue to use whatever therapeutic measures serve best to improve all functions of the body, to overcome any infection that may be present and to prevent or correct deformities, in order to obtain the closest possible approach to normal health and activity.[2] Through such measures we may hope to bring the disease to quiescence slowly, and, by their continuance, to prevent a recurrence of the arthritic symptoms. End-result studies both here and abroad suggest that these are the most satisfactory procedures.

Spontaneous recoveries do occur in the more severe forms of chronic arthritis, but are rare indeed. All good therapy in chronic arthritis is simply an aid to the defensive and reparative processes of the body, for in the ultimate analysis it is the patient who cures himself. While bacteriological and serological studies have deepened our insight into the problem of chronic arthritis, to paraphrase Boccelli, "the bacillus is not yet all of chronic arthritis." No single therapeutic approach has proven adequate and our attack has, of necessity, become a general one with due consideration to the whole body. In an attempt to meet this problem of the general care of the patient crippled by chronic arthritis, certain concepts and methods of body mechanics[3] have been developed during the past twenty years at the Robert B. Brigham Hospital.

First among these concepts in body mechanics was the recognition of differences in the general anatomical structure of individuals. These anatomical differences group themselves into two main divergences from the so-called normal described in text books, those who are more slender in body-build, and those who are more heavy. Each of these show differences in the mechanical use of the body as well as varying tendencies to strain and to pathological changes in tissues. The slender type has longer ligamentous structures and greater range of motion in joints, while in the heavy type, ligaments are relatively shorter and the range of motion is considerably decreased. With the understanding of differences in the body-build of individuals came also the appreciation that health was dependent to a large degree upon the manner in which the body was used, that there was a dependence of special structure upon proper mechanical relationships for function. In an appraisal of the mechanical factors leading to disturbed function of the body in chronic disease like arthritis, we are prone to consider only the obvious external ones which lead to well recognizable strain and deformity; and we forget that viscera, also, may develop impaired function from the same causes.

The clinical and pathological studies upon chronic arthritis of the past three decades have been summarized in the reports of the American[4] and British[5] committees for the study of this disease. Two great types of chronic arthritis have been differentiated; rheumatoid arthritis and osteoarthritis. Helpful as this may be for classification, more recent clinical and laboratory studies have shown frequent difficulties in diagnosis because of mixed features of both types of chronic arthritis in the same patient. It is generally agreed that both are chronic systemic diseases. Both of these types of chronic arthritis arise in joints through varying combinations of etiological factors, heredity, strain, fatigue, chance infection, faulty diet, and innumerable physiological disturbances. The differences in response shown by these two kinds of chronic arthritis may in part be due to physiological differences in individuals of different body-build. The anatomical and physiological differences of these two types have been carefully reviewed by Pryor and Lucas.[6] It is well known that rheumatoid arthritis is more commonly seen in individuals of the slender anatomical type while osteoarthritis is usually found in the heavy type.[7]

Chronic arthritis occurs less frequently in joints where normal function is not disturbed. Normal function in a joint is dependant mechanically upon proper anatomical alignment of the bones, adequate ligamentous support and the appropriate direction and strength of muscular pull. In faulty body mechanics, often all of these may be wrong. This is seen particularly well in the spine and lower extremities. When the body is badly poised, weight is often not well balanced over supporting structures. Muscular pull and tension are altered from the changed alignment of the body. Slight disparity of the articular surfaces of joints frequently results, a condition which Preiser[8] called incongruence. Long continued use of joints in such positions leads to local musmular fatigue from the less efficient use of the muscles in movement, and to muscular strain since certain groups of muscles must bear all of the weight, and it is not equally distributed between opposing muscular groups. As the muscles become fatigued they eventually relax

From the Robert Breck Brigham Hospital, Boston.

Read at the Meeting of the Academy of Physical Medicine, Atlantic City, N. J., June 12 and 13, 1935.

and the pull then is on the ligaments. This leads to capsular relaxation at joints and instability or subluxation of the joint may occur.[9]

The changes which occur in the function of joints and the mild repeated traumata to their supporting structures, when the mechanics of the whole body are faulty, lead to inflammatory changes in the synovial membrane,[10] and, to a lesser degree, to degenerative changes in the articular cartilage. It is believed that infections occur much more commonly in traumatized tissues where local resistance is decreased and attack those articulations most severely that have been subjected to strain, or chronic trauma.[12] Key has observed the pathological changes characteristic of rheumatoid arthritis after a single injury to a joint.[13] Zollinger has mentioned trauma as a localizing factor in the development of a chronic arthritis.[14]

These effects upon articulations and muscles, leading to fatigue, strain and impaired function when faulty body mechanics is present, are readily demonstrable. A number of related internal and visceral changes are found with faulty body mechanics which cannot be demonstrated so easily. Many cannot be defined accurately and their relationship to faulty body mechanics and also to a later developing chronic arthritis cannot be definitely established. But the mass of clinical and experimental evidence suggests that such relationship exists, especially in the functional disturbances seen particularly in the circulatory system and in the abdominal viscera.

In faulty body mechanics the circulation may be hindered in several ways. With the sag of the body, the increased downward inclination of the ribs and the relaxation of the suspensory ligament of the diaphragm, the diaphragm assumes a lowered position; the position of the heart becomes changed and the great vessels are pulled upon. These are factors recognized by cardiologists.[15] Both the pull upon vessels with the consequent narrowing of their lumina and the mediastinal constriction from the flattening of the chest antero-posteriorly interfere to a limited degree with the circulation as Podaminsky has shown.[16] A more important feature, however, is the disturbance in the function of the diaphragm. With the lowered position which the diaphragm assumes in faulty body mechanics, since it is attached to the thoracic cage, a decreased excursion of the diaphragm occurs[17] as Hoover has shown. With decreased diaphragmatic excursion Hill[18] has observed a decreased return of blood to the right side of the heart, and a slowing of the peripheral circulation may occur. Studies of blood flow[19] and of the capillary bed have frequently shown that there is frequently a slowing of the peripheral circulation in chronic arthritis. In a large number of patients suffering from chronic arthritis the writer has observed lasting improvement in the peripheral circulation following the correction of the faulty body mechanics, with the resulting higher position and increased excursion of the diaphragm.

The changes in the shape of the thoracic cage and the position of the diaphragm have an effect also upon the vital capacity. We believe this to be important in every case of chronic arthritis but of paramount importance in chronic arthritis of the spinal type, Strumpell-Marie Arthritis,[21] where the forward bowed back and the fusion of the costal articulations in the position of expiration if not prevented spell increasing curtailment of activity and early exitus. The state of health cannot be expressed by any mathematical formula but industrial physicians are agreed that a measurement of the vital capacity is one of the best single indices of physical fitness and endurance.[22] The vital capacity is very sensitive to changes in well being as studies in pulmonary and cardiac diseases have shown. It can at times be doubled within a few months in arthritic patients with correction of the faulty body mechanics.

Less easily measurable but equally important are the effects of faulty body mechanics upon the abdominal and pelvic viscera. Visceroptosis and crowding of the organs in the abdominal cavity result from faulty body mechanics as soon as the support of the well-contracted anterior abdominal wall is gone, as Coffey[23] has so well shown. That disfunction results from displacement, crowding and circulatory disturbance, is attested by numerous reports. This is particularly true in the large bowel. Not only is excretion hindered, but assimilation also. In the patient confined to bed when the body mechanics is poor, the lax muscular tone frequently permits the lateral abdominal wall to pouch out in hernia-like posterior and lateral prominences. With support from a belt or shell until the body mechanics has been corrected, rapid improvement in nutrition and execretion is observed. In many of these patients this improvement in body mechanics has been associated with a disappearance of the numerous vague intestinal complaints so common in the chronically ill.

From its very nature, chronic arthritis, even in the earliest stages, requires mechanical treatment.[24] Few cases recover without residual articular damage. It is here, both in the prevention of deformity, the avoidance of severe joint damage, and for the after-care of the joints in attempts to prevent a recurrence of symptoms that correction of body mechanics is most important. Joints which are kept both in recumbency and when erect in positions best suited to function and with the least possible strain, will be much more likely to heal with the least deformity and injury. When the disease is apparently quiescent as shown by general improvement, decreased sedimentation of the red blood cells, and by the absence of local symptoms, we have found—by long experience in out-patient care and by end-result studies—that the maintenance of good body mechanics combined with good general hygiene is the best safeguard against a recurrence of arthritic symptoms.

The correction of faulty body mechanics is not offered as a cure of chronic arthritis but as a necessary measure if patients are to recover with a minimum of deformity. The maintenance of good body mechanics is important if the patient is to remain free from articular symptoms. As in every chronic disease, so in chronic arthritis, innumerable therapeutic measures have been advocated which are useful for certain features, such as dietary regulation, removal of hidden infection, vaccine therapy, eliminative measures, endocrine regulation, and the injection of substances to stimulate the reticulo-endothelial system. Optimism in the therapeutic effect of any single measure must be tempered by the knowledge that temporary remissions are not uncommon but that lasting improvement or so-called "cure" is not so easily obtained.

Our attack upon chronic arthritis has varied greatly during the past quarter century. We have had ample clinical demonstration of the usefulness and the limitations of therapy applied to the affected joints alone. We have observed the imprudence of attempting heroic measures such as we apply in acute disease. Chronic arthritis has no definite course and it is not self-limited as are acute diseases. The unfortunate end-stages in a number of patients suffering from chronic arthritis, without con-

tinued attempts to improve the patients' health or incapacity, have been shown by Nissen in end-result studies from the Robert Breck Brigham Hospital.[25] Long continued therapeutic efforts are usually necessary to prevent increasing invalidism and gradual impairment in health. The correction of body mechanics offers an approach in the treatment of these patients where there is not only articular deformity but a profound failure of the whole body to do its work. Long experience in the care of chronic arthritis has shown that recovery with a complete return of normal articular structure and the normal articular function is often not obtained. However, with good medical care, beginning with prolonged rest in bed, good general hygiene and correction of the faulty body mechanics, the majority of these sufferers can be returned to their previous occupations. The lowered general resistance, rapid tiring on exertion, and the tendency to a recurrence of arthritic symptoms are changed slowly. The patient must give consideration to these restrictions during convalescence. This does not necessarily mean a permanent limitation to activity but the change to the state of normal health takes place very slowly, and the process of recovery of health cannot be hastened artificially.

In this struggle to regain a normal state of health in chronic arthritis, the practice of good body mechanics must be continued until the right use of the body becomes habitual. There is no rapid improvement, for the changes in the alignment and function of the body take place slowly. The result is dependent chiefly upon the patient's own efforts. Both physician and patient must know what they are working for, and then continue with a rational program until the desired end is obtained. Good body mechanics is not secured by exercise alone. The exercise must accomplish something, and that something is an improvement in the mechanical use of the whole body with a resulting decrease in strain and fatigue. Often exercise must be preceded by a prolonged period of rest, and physical measures to correct the faulty body mechanics must proceed slowly, with due regard to the general condition of the patient and also the pain in the joints resulting from activity. Careful, and long-continued, guidance of the patient is necessary in this attempt to secure normal function of the various parts of the body.

SUMMARY

The treatment of chronic arthritis still awaits complete solution. Every means at our disposal must be used to prevent crippling deformity and to regain health. The correction of faulty body mechanics, an almost universal condition in patients with chronic arthritis, aids greatly in securing improved articular function, in avoiding strain and fatigue, and in improving the general physiology of the whole body. It must be carried out under careful supervision and must be long continued to be helpful in recovery from chronic arthritis and in the avoidance of a return of the symptoms.

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The Crippled Children's Guild of Buffalo, New York

Orpah E. Cable, Adelaide P. Fowler, Helen S. Foss

Founded twenty-eight years ago as a non-sectarian institution, the original purpose of the Guild was to provide a home for crippled children. Shortly after organization, the Board of Directors (sixteen women) recognized that this plan did not go far enough. Therefore, the objectives for some time have been to give the crippled child that care which aims to return him to society —a potential self-supporting member.

Besides the orthopedic care which is continued by the orthopedic surgeon until the child has his maximum improvement, each child has a complete physical examination by members of the medical staff, a mental examination by a psychologist, and the continuance of his education under the supervision of the Buffalo Department of Education. The latter supplies two full-time teachers, and part-time teachers as necessary. Every effort is made to carry through to completion all recommendations.

There is time to establish better nutritional and health habits since the children are in the Guild from six months to two years or longer, depending on the severity of the orthopedic involvement. This is quite important in dealing with under-privileged children.

The three physical therapists who work under the

1930 Poliomyelitis case. Admitted 1932. "Every One Should Have Their Chance."

supervision of the orthopedic surgeon, chief of staff, treat approximately twelve cases per day, give muscle examinations routinely, and make removable plaster boots, stretching casts and splints as prescribed. While this is a heavy load, the time element is controlled by alternating the severely involved cases with those of less involvement.

In presenting the following cases and pictures, it has not been the aim to approach the problem of the crippled child from the research angle, nor is it believed that there are any new or startling facts to offer. But, it is hoped that through a series of case reports and pictures there will be shown the earnest effort the Guild is making to further the work. Although the turnover of cases is not rapid, each year finds a different distribution of types. The present population is composed of cases of:

Poliomyelitis
The spastically paralyzed of good mentality
Obstetrical arms
Congenital club feet and anomalies

POLIOMYELITIS

Poliomyelitis presents one of the major problems. Usually the cases are referred to the Guild by the attending physician, some agency or by a state worker. When a recent case is admitted, the routine procedure is warm baths and radiant heat as long as sensitiveness prevails. During this period great care is taken to prevent the stretching of paralyzed muscles and the contractures of others by the use of the Bradford frame, removable plaster boots, splints, et cetera. As soon as possible, massage and muscle training, which are controlled by the patient's tolerance, are begun, and are continued until maximum muscle power has been obtained. Then the patient is allowed to weight-bear with braces if necessary. The Guild's policy is possibly a longer period of rest treatment than is usual where only an out-patient service is rendered. Experience has taught that when the treatment is continued over a sufficient length of time a better functional result is obtained.

Case I. A girl born March 10, 1927. Onset of Poliomyelitis, July, 1935.

Very severe involvement of all muscles of both extremities, back, abdomen, neck and face. The latter part of September, the mother noticed some return of power in hands and legs.

Admitted to the Guild October 11, 1935.

Her muscle grading when completed showed fifteen groups "fair," all others "poor" or "trace," marked lordosis, atrophy of all groups, and nineteen pounds under weight. A recent examination by contrast is quite outstanding since there had been no apparent spontaneous return of muscle power following onset; abdominal muscles "fair," all other groups "good" or better, lordosis practically reduced, and a gain of twelve pounds in weight.

The treatment routine has been as follows: radiant heat, ultra violet massage and muscle training, Bradford frame, long posterior plaster splints which are fastened together at feet to prevent the upward tilting of right side of pelvis as well as to prevent deformities developing at knees and ankles, arm abduction slings to protect weak deltoids, and hand splints to prevent contraction of fingers and thumb extensors.

This case will not be allowed to weight bear until the Guild surgeon feels that return power is stabilized.

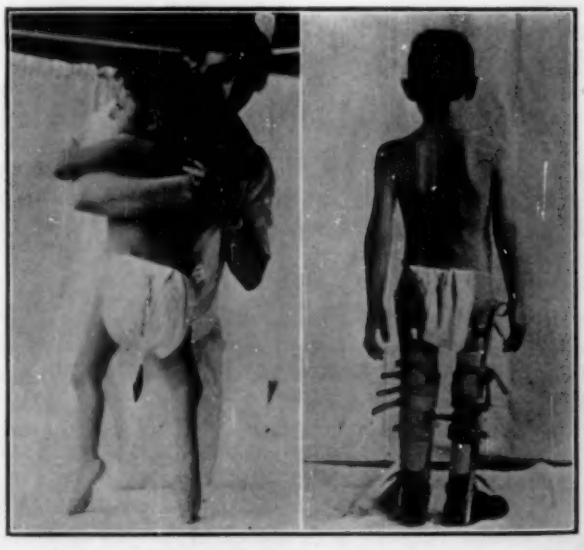
Case II. A girl born February 14, 1923. Onset of Poliomyelitis, September, 1930.

Involvement of muscles of both extremities, back, abdomen and neck.

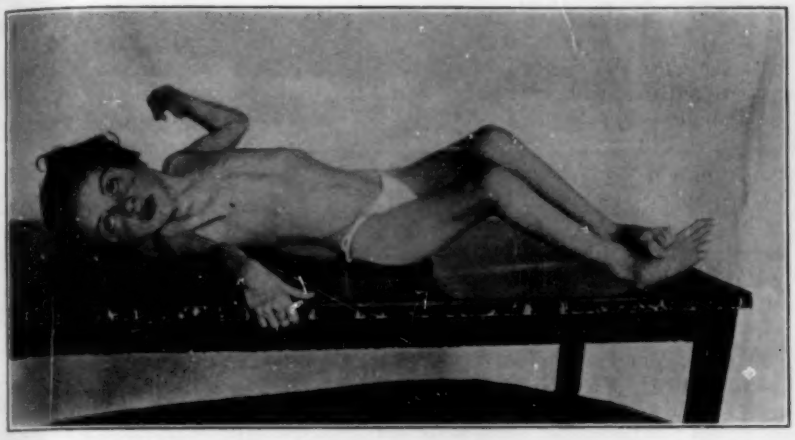
Admitted to the Guild January 7, 1933. This child had been allowed to sit up and stand. Being thirty pounds overweight, she presented a very discouraging appearance. Her muscle examination showed a scoliosis, abdominal groups "poor," left leg "flail," "bilateral back-knees," hip muscles severely "involved," right deltoid "zero," left deltoid "fair," and deformities of feet.

The regular treatment routine of rest and physical therapy was followed plus diet and glandular therapy. On October 16, 1933 she was given a Knight back brace with a reinforced abdominal support and a left long caliper; weight bearing was started.

On September 7, 1934, her muscle examination showed improvement of power in most muscle groups while contractures were reduced or improved, as well as a reduction of twenty pounds in weight. She was able to walk.



1929 Poliomyelitis case. Unable to stand at 4 years. Admitted 1932. Discharged 1934.



A spastic case. Admitted June 4, 1935.

On November 27, 1934, discharged; weak but functional results.

On March 3, 1936, the State Nurse reports this case has retained muscle power gained.

Case III. A boy born July 23, 1928. Onset October 22, 1929.

Involvement of both legs, back and abdominal muscles.

Admitted to Guild April 25, 1932.

Muscle examination showed an undernourished child with both legs, abdomen and back muscles severely involved with marked deformities of both legs and feet; child was unable to stand. Routine treatment was started with emphasis on gentle stretching of contracted muscles. On April 1, 1933, he was given two long calipers and crutches. Weight bearing was started. January 29, 1934, he had a right Hoke plastic.

On September 5, 1934, muscle examination showed back and abdominal muscles much improved, right and left hip and knee contractures reduced, right foot surgically corrected, left foot valgus deformity.

On November 8, 1934 discharged. Walking.

On November 30, 1935 home care inadequate; deformity of left foot increasing, also some return of contractures. To be returned to Guild for surgery on left foot and physiotherapy.

The Birth Injured

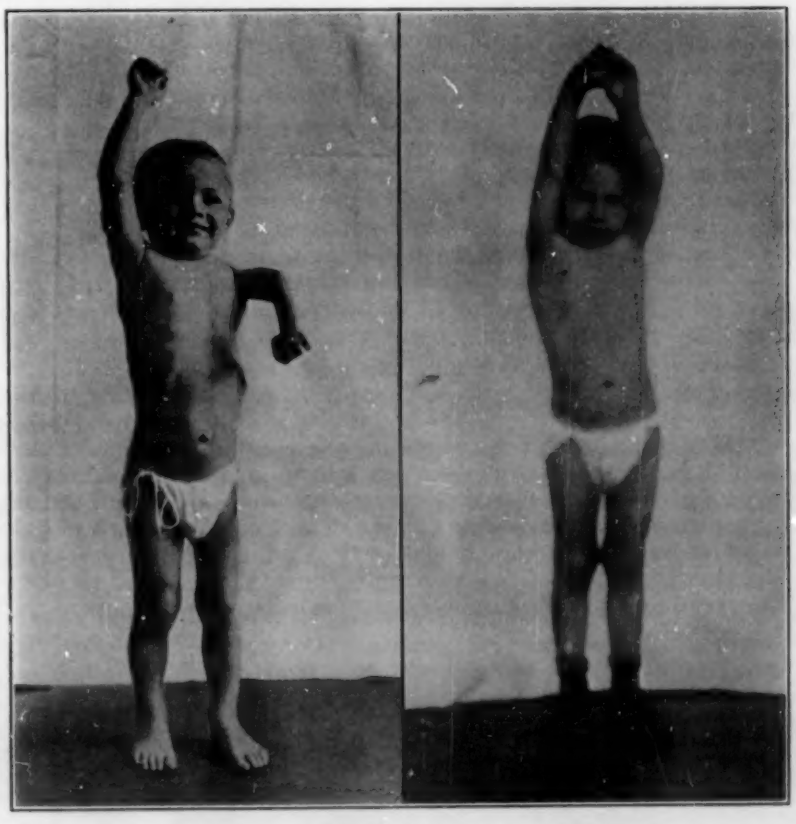
The Guild's experience with the spastically paralyzed group agrees with that of others who work with these children. It is found that many who have been considered hopeless—even feeble-minded—respond to treatment.

Case IV. A severely birth injured girl born July 25, 1930.

Early history shows an undernourished mentally retarded child of four years of age who cannot talk, or sit up, is uncooperative, and reacts slowly to stimuli.

November, 1934, Bilateral Tendon Achilles lengthening and section of nerve supplying the gastrocnemius.

Two months later.



Obstetrical arm case. Admitted June 27, 1934—Still under treatment.

March 14, 1935, Bilteral Stoeffel of obturator nerve.

On June 4, 1935, when admitted to Guild, she still was much undernourished and uncooperative. Her sleeping and nutritional habits were poor. Progress was shown in an attempt to talk and ability to sit up. A psychological examination gave age five years, mental age three years, eight months.

This child has responded to Guild routine and physical therapy which emphasized relaxation, muscle re-education, better sleeping and nutritional habits. The improvement has been almost unbelievable as shown by her pictures taken upon entrance and two months later, as well as by a psychological re-test on December 17, 1935; age five years, five months, mental age five years, eight months. At this date, the child is continuing to show a steady improvement.

Congenital Club Feet. Admitted April 30, 1934. Discharged August 30, 1935, following surgery and Guild treatment.

NOTE: It has been found that shark-skin tipped shoes takes the place of metal tips and attracts less attention.

Case V. A boy born November 29, 1931.

Left obstetrical arm, upper, lower and hand type with definite contractures. Early history reveals no recognized medical treatment. On June 27, 1934 admitted to Guild.

This child had physical therapy consisting of radiant heat, massage, gentle stretching of contractures, exercises, abduction splint and special stretching casts. He is responding to treatment. At an early date he is to have the flexor carpi ulnaris transplanted into the head of the radius to assist in supination.

CONGENITAL CLUB FEET

If congenital club feet are put under treatment soon after birth, they rarely find their way into an institution, but unfortunately far too many escape until surgical interference is necessary. The routine of the surgeon is to admit the child to the Guild sometime prior to date of surgery for physical therapy which consists of massage, gentle stretchings, exercises and removable stretching boots which are renewed as often as correction permits. When the foot is corrected as much as possible, the child is admitted to the hospital for a "Hoke Plastic." Then he is returned to the Guild for physical therapy after the surgical cast is removed.

Case VI. A boy born December 14, 1932.

Father and paternal grandfather had congenital club feet.

On April 25, 1934, admitted to Guild for physical therapy.

On September 29, 1934, Left Hoke Plastic.

On March 29, 1935, Right Hoke Plastic. Posterior plaster boots were worn after surgical casts were removed.

On August 30, 1935, discharged wearing Sabel club feet shoes.

CONCLUSION

In conclusion a definite attempt is made to project the treatment into the home after the child leaves the Guild by teaching the parents the exercises. If in Buffalo, the child returns to Guild for check-up; if the child lives outside of the city, he is referred to the state orthopedic nurse, who supervises his care.

The Guild believes that there is a definite psychological angle to a physical therapy department for both the worker and the child. The goal is "Every child has a right to be normal." Therefore, all treatments are given with the expectation of this end result. By so doing, each child has his maximum chance for a complete recovery or as near this goal as it is possible to approach. The attempt is made to teach and make the child understand "I get myself well; others only help," and before he is discharged "I keep myself well." If the child is too young to understand, a definite attempt is made to instill in the minds of the parents that the treatment has only begun and that it is necessary for them to carry on. When the methods are successful, it has been found that the child is not re-admitted to Guild unless for deferred surgery but when the child is uncooperative or the home care is inadequate, he soon returns.

Ionic Medication

Richard Kovacs, M. D.

The story of the rise and fall of the vogue of ionic medication forms an interesting chapter of modern physical therapy.

Ionization, as the term is employed in physics denotes the breaking up of any substance into its component electrically charged ions by an outside force, usually an electrical current. When a direct (galvanic) current passes through a solution, it causes a migration of the ions in a definite direction; those with a positive charge are attracted to the negative and those with a negative charge to the positive pole.

Leduc, the chief originator of ionic medication, maintained that it enabled the introduction of drugs in any quantity into the body, at the exact point required. As a large number of drugs are soluble in water, and thus are in an ionic state, it seemed a simple and effective method to introduce the ions of such drugs into the skin or mucous membranes by the polarity effect of the galvanic current. All that is needed is to saturate a pad electrode with the solution, connect it to the proper pole and drive the ions by the current into the tissues according to their polarity. It has been amply corroborated that ions with a positive charge—zinc, copper, quinine, cocaine—are introduced into the skin and mucous membranes from the positive pole while ions with a negative charge, like iodine, chlorine salicylic acid, are introduced into the tissues from the negative pole. Leduc proved with classical experiments on rabbits that the effect was actually due to the flow of the current and not to simple absorption by the skin from the pad soaked with the solution of the drug.

Leduc's experimental work stimulated a widespread employment of ionic medication in the early part of this century. Specific drug effects were claimed in treatment of many conditions, such as rheumatic conditions, gout, neuritis. Subsequent investigators, however, established the fact that the moment a medicinal ion enters the body it is almost immediately deprived of its charge by the electrolyte salts of the body fluids, the blood stream and lymph. Thus it was claimed that ions from the outside cannot be introduced into any but the most superficial tissues, and the beneficial results in lesions of deeper structures with ionic medication were simply due to the passage of the galvanic current itself and not to any medicinal solution in which the electrodes are soaked.

As a result of these later investigations, the use of ionic medication became gradually restricted to the employment of antiseptic zinc and copper ions for the treatment of infected surfaces, sinuses and cavities and to the use of chlorine ionization for loosening superficial scars. Very recent clinical and experimental work with vasodilating drugs (histamine and cholin compounds) showed however, that if drugs suitable for penetrating the skin are introduced in sufficient quantity by ionization, they are absorbed into the general circulation and bring about profound stimulation of local circulation and marked systemic effects. These findings and the striking clinical results in chronic arthritis, rheumatoid and other conditions, have brought about renewed interest in ionic medication or iontophoresis.

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General Technique of Iontophoresis

The technique of ionic medication varies according to whether the skin or mucous surface is being treated. For treatment through the skin an active pad electrode is made of sufficient thickness of absorptive material to hold the solution and to keep moist during the treatment. Gauze of a thickness of one-half inch (about sixteen layers) is best, but cotton or felt of the same thickness may serve also. The pad is soaked with the solution at a temperature of comfortable warmth. The strength of all solutions should be one percent, as no advantage is gained by making it stronger. The saturated pad is laid on with good contact over the area to be treated A metal plate of somewhat smaller size is placed upon this pad, being very careful that the metal edge nowhere touches the skin; even a minute, direct contact between the metal and the skin may lead to a chemical burn. For the introduction of vasodilating drugs a special technique has been developed by the use of reinforced asbestos fabric paper which absorbs sufficient fluid and keeps moist for a long time. The fabric paper cut into strips of suitable size and shape is saturated with the solution of the drug to be introduced; it is then carefully wrapped around the affected area and is partly covered by a metal plate; one must be extremely careful that there is no thin or torn part of the paper through which the plate can touch the skin.

For treatment of mucous surfaces—the cervix, nasal cavity or the inner ear—a metallic electrode, solution or packing containing the ions is placed in direct contact with the walls of the cavity and serves as the active electrode. For a dispersive electrode, a pad electrode or larger size than the active electrode is soaked in hot water or saline solution and is placed in good contact with a convenient part of the body surface. A foot or arm bath may also be used as a dispersive electrode in all forms of treatment.

In ionic medication the connection of the active and dispersive electrodes to the correct poles of the galvanic generators is of the utmost importance and treatment must not be started until the operator is absolutely certain of the proper polarity.

The strength of the current used in ionization should be generally the maximum that can be tolerated with comfort, this varying according to the size and location of the active electrode. Mucous membranes tolerate a heavier current and the current strength there must be estimated on the basis of practical experience. The length of treatment varies with the condition; one-half hour is considered the minimum time for treating scars; ten to fifteen minutes may be sufficient for copper ionization in endocervicitis and indolent ulcers; twenty minutes for mecholyl-ionization in chronic arthritis.

It is important that if treatment pads are to be used again they be thoroughly cleaned and rinsed after each treatment in order to get rid of the secondary chemical products near the metal plate. The asbestos fabric paper

can be employed two or three times and is simply remoistened each time.

CHLORINE IONIZATION

When a pad electrode is soaked with common salt solution, placed over scar tissue, and connected to the negative pole of a galvanic source, while the positive pole is connected to a large dispersive pad electrode, under the influence of the current sodium hydroxide ions are formed at the negative pole. These ions exert mildly caustic and solving effects in scar tissue in accessible locations. Dense and heavy superficial scars are made more pliable and become more amendable to subsequent mechanical stretching by massage. Lighter scars and the discomfort caused by them can be often fully relieved by chlorine ionization alone.

COPPER AND ZINC IONIZATION

Ions of copper and zinc exert a local germicidal effect and devitalization of tissue in proportion to the strength and the length of flow of the current. A thin or heavy slough forms, which slowly separates from healthy new granulation tissue formed underneath. These caustic ions serve for control of infected granulation tissue, for the stimulation of indolent ulcers and for the sterilization of infected sinuses. They are all introduced from the positive pole.

Copper ionization is applied in the treatment of endocervicitis through a copper cervical electrode. For treatment of a sluggish wound or ulcer all interstices are packed with small pledgets of cotton soaked in a one per cent copper sulphate solution. A smaller size metal electrode is placed on top of this layer and is held in position by a rubber bandage.

Zinc is the most antiseptic of the caustic ions and the most frequently used. It may be employed in the form of either zinc sulphate or zinc chloride, at one to two per cent strength. Infected sinuses, indolent ulcers, selected forms of chronic otitis media and of vasomotor rhinitis (hay fever) respond satisfactorily to zinc iontophoresis.

VASODILATING DRUGS

The rationale of introducing vasodilating drugs by the polarity effects of the galvanic current is based on research work pointing to a close connection between disturbed peripheral circulation and arthritic conditions. These studies show that in arthritis there is a tendency in the capillaries of the skin toward relatively empty vessels and a sluggish flow of blood. There is much less blood as a whole in fewer capillaries to be seen in many cases of arthritis than in normal persons. The circulation is often sluggish and interrupted and there is apt to be present a contrast between the venous and the arterial side. The favorable influence of agents, medical or remedial, causing vasodilatation, is based on these considerations.

Histamine and choline compounds notably mecholyl (acetyl-beta-methyl-choline-chloride) are the drugs with which considerable laboratory work as well as clinical work in the treatment of rheumatoid conditions has been done in recent years. They exert vasodilative effects, histamine acting principally on the skin capillaries while choline compounds influence more markedly the small arterioles. In the technique of application, the drugs being alkaloids, they are introduced from the positive pole, which repels them.

A one to one thousand solution of histamine acid phosphate applied on blotting paper for a few minutes from the positive pole produces an immediate intense skin hyperemia; soon wheals crop up and the whole area is turned into a patch of urticaria; the temperature of the area treated is raised from 2° to 3° C. and the skin does not return to its normal appearance before five or six hours. This treatment has proven most successful in chronic myositis and in traumatic arthritis.

Mecholyl (acetyl-beta-methyl-choline-chloride) is a choline compound and is employed in a 0.5 to 0.25 per cent solution for ionization. Asbestos fabric paper is thoroughly moistened with the solution and wrapped around the area to be treated—the entire shoulder, one or two hands, both knees, etc.

Well defined objective as well as subjective local and general changes and consistent laboratory findings follow each application of mecholyl iontophoresis. The objective changes are: slight redness of skin, which persists for one and a half to two hours, this being probably due to the dilatation of the deeper small arterioles; signs of "gooseflesh," immediately after treatment, which disappear after ten to thirty minutes (this is due to stimulation of the erector muscles of the hair follicles); perspiration immediately after treatment, which continues for eight to ten hours (this effect is most likely due to the direct action of mecholyl on the sweat glands or their nerve supply); increase of skin temperature from 4 to 10 degrees Fahrenheit and remaining from two to four hours, this being explained by the hyperemia already described.

The subjective changes are a sensation of warmth in the parts treated, this feeling being maintained from twenty-four to seventy-two hours, and in some cases even longer as treatment is continued.

When large areas are treated there is often a marked general effect, consisting of flushing of the face, perspiration all over the body, increased salivation, a rise of the pulse rate, a slight lowering of the blood pressure, and, at times, increased intestinal peristalsis. These effects become generally manifest after ten minutes and cease soon after the treatment is brought to an end. Their intensity varies according to the individual.

The occurrence of these systemic effects proves that the action of mecholyl by iontophoresis is not confined to the surface of the skin and hence it is quite different from a simple counter-irritant. The general reaction points to the absorption of the drug by the circulation. The therapeutic effect of this form of treatment might be explained by the deposition of the drug in the superficial tissues and its slow absorption from there, causing a pronounced and prolonged local effect combined with prolonged slight systemic vasodilatation.

The clinical results of mecholyl iontophoresis given at intervals of two or three days in rheumatoid arthritis are subjective comfort, gradual elimination of swellings, if not too far advanced, and definite improvement in function. Osteoarthritis did not show similar clear cut improvement. Mecholyl iontophoresis now is a method of choice in the local treatment of rheumatoid arthritis affecting several of the smaller joints.

Another valuable use of mecholyl iontophoresis is in the treatment of varicose ulcers as reported recently by J. Kovacs and J. S. Wright. In these cases the entire skin surface of the leg is treated with the exception of the area of the ulcer.

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Method of Photographic Record in the Posture Clinic

F. R. Harding

The purpose of this article is to make you familiar with the various types of photographic apparatus, and to give some idea of how this apparatus is employed.

There are various terms used in photography which are not understood by the average individual. An attempt will be made to try to explain those commonly used. The shutter is an instrument which opens and closes when the cable or shutter release is pressed. It's purpose is to allow light to pass through the lens and expose the film. Shutters are of two general types. The most common is called a "between lens" shutter, the other is the focal plane shutter. The former takes two forms, first a self setting, and, second, a manually set shutter. They may be distinguished at a glance. The first has only one plunger or horn set in the rim of the shutter and the second has two plungers or horns, one of which must be pressed to set the shutter and the other to make the exposure. This type must be re-set after each exposure. The focal plane shutter is the type used in the Graflex camera. The focal plane shutter is always at the back of the camera, hence its name, focal plane, it being placed in the focal plane of the camera. It is the most nearly accurate, as regards its actual speed and its rate or marked speed. It also has a far greater variety of possible speeds, especially in the more rapid exposures, but it is deficient in slow exposures, that is, those below 1/10 of a second. The between the lens shutter is very inaccurate. By this is meant that its rated speed and its actual speed do not nearly coincide. In actual practice this tremendous error bothers no one, unless an attempt is made to tell someone how to make a picture under given conditions, with another camera. To illustrate, if one shutter goes off at a rated speed of 1/25 second and an actual speed of 1/15 second and another shutter goes off at a rated speed of 1/25 second and an actual speed of 1/5 second and both cameras are set up under the same light conditions and same diaphragm opening, and an exposure made, the resulting negatives are not going to be of the same density, although the shutters rated markings are both 1/25 second.

The iris diaphragm is usually called the diaphragm and is placed between the front and rear lens elements. The diaphragm is divided off into what are called F: numbers or stops, for example:—F:8 is stop 8. The numbers commonly found on the lens are:—F:4.5-5.6-8.-11.-16.-22.-32.-44.-64. This is called the F: system. Some very old kodaks are marked with the U. S. or Universal System. These numbers have not the same relative values of the F system. The U. S. system usually starts with 4. The function of the diaphragm is twofold. First it is a means of controlling the amount of light which passes through the lens, and, second, it, in conjunction with other factors, controls depth of focus. The function you will be most concerned with is its use in controlling light. The smaller the diaphragm opening, the greater the exposure necessary. For all ordinary posture record, F:8 is used. When the diaphragm is set at any stop except the largest, which will be the lowest number on the scale, F:4.5 or 7.7, etc., we say that the lens is stepped down. The means employed to reduce the diaphragm opening varies with different manufacturers. Some have a knurled ring around the lens barrel which must be turned. Others have a lever at the top or bottom of the shutter which must be moved. The F: numbers are engraved either on the lens barrel or on a scale plate fastened to the front of the shutter. Single lens cameras do not commonly have an iris diaphragm.

Cameras are divided into several types. Reflecting cameras, of which the Graflex is an example, view cameras, which are usually used by professional photographers, the miniature camera, which has a tremendous vogue among amateurs at the present time, and the well known folding pocket camera such as the kodak. These cameras use a wide variety of negative material, roll films, film pack, cut film and plates. Each has its good points and faults. For record work such as is usually done in posture clinics, the Graflex or the view camera will produce the best results, the advantages for the amateur being with the Graflex, because the full size image of the patient is seen on the ground glass almost up to the instant of exposure. This is not true of the view camera. The miniature camera is not well suited for posture record. The photographs are too small to be of much practical value unless they are enlarged. If this is done the expense amounts to practically the same as though a larger negative had been made. It is an extremely fine camera for the amateur who wishes to do his or her own finishing, and who has the time and money to devote to it. But it is not practical for use in posture records. The folding pocket camera can be used for posture records in an emergency. Many have very small view finders which make it very difficult to see the patient in the finder. They usually do not have facilities for ground glass focusing, so one must measure the distance from the patient to the lens, and the distance must coincide with the arbitrary markings on the distance scale of the camera. This means that if the scale is marked 6-8-10 feet, etc., the patient must be at exactly one of those distances, whichever is most suitable. If this is done carelessly the photographic image will not be clear or sharp and this is unpardonable. Another disadvantage of this type of camera is that it usually employs roll film, which means that the entire roll must be used before it is removed from the camera. If the camera can be fitted with a film pack adapter this disadvantage is eliminated, because individual exposures may be removed from a pack in any photographic dark room. Any camera employed for posture record should have a ground glass back upon which to focus a sharp image of the patient. This is almost the only way one can be assured of clear cut photographs. There must be some sort of tripod or stand upon which the camera is securely fastened. The average folding tripod is not very secure with a heavy camera such as a Graflex placed upon it. The most suitable is what is called a "home portrait stand." Whatever type of tripod is

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chosen, one should be certain that there is a chain or stop of some sort on the legs so that the tripod will not suddenly collapse when placed on a polished floor. Spurs on the leg ends should be removed and replaced by rubber buttons.

There are many kinds of illumination that *may* be used, but most of them are not particularly good. Daylight is one of the poorest light sources, due to its constantly varying intensity, and the fact that most of its actinic rays are absorbed by window glass. These two things cause great difficulty in estimating the proper exposure. Mercury vapor or arc lamps can be used but are not recommended. In the case of the former there is nearly a complete absence of red and a surplus of blue-violet and ultra violet light. This causes slight skin imperfections to appear black in the photograph. This fact is also true of arcs unless panchromatic carbons are used. Also, unless an automatic feed for the carbons is

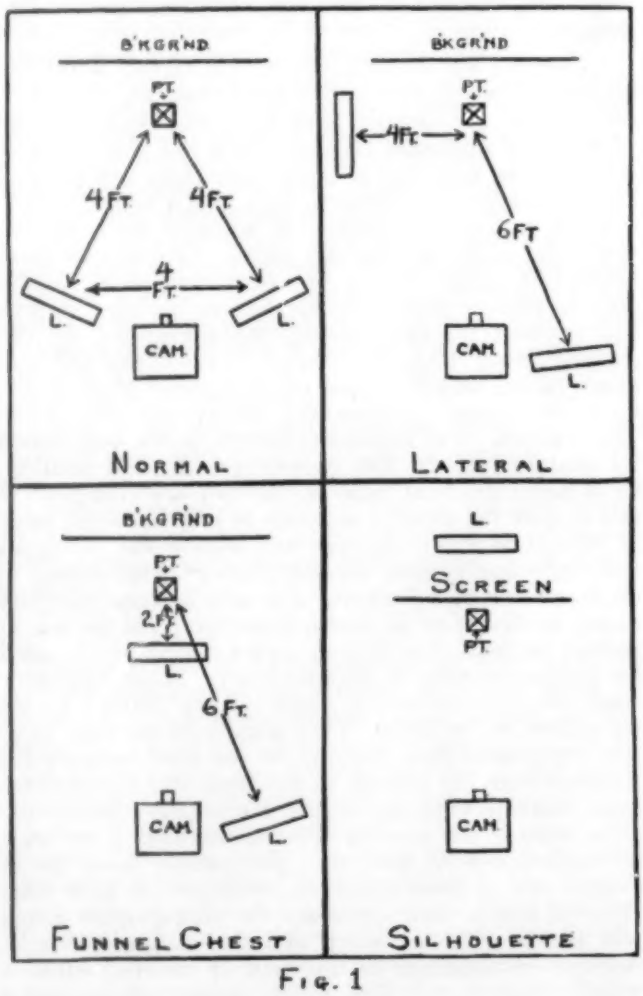

FIG. 1

employed, the arc usually dies or flickers, just as the exposure is to be made. Incandescent lamps are by far the most portable, safest and cleanest to use. These may take the form of 1,000 watt lamps in reflectors, or photo flood lamps. The latter have a fairly short life, but are most suitable for posture record because they are not burned for any great length of time. If a great quantity of record work is to be done where the lamps would be burned 4 or 5 hours a day, the 1,000-watt lamps would be needed. These lamps are very much more expensive than the photo floods, as are the reflectors with which they are employed. In the average clinic the photo floods will prove entirely satisfactory. No special fuses are necessary as long as not more than 5 are used at once. *If 1,000-watt lamps should be used, the institution's electrician must be consulted when more than one lamp is used, as they draw a great deal of current.* Photo flash bulbs are sometimes recommended and they work perfectly, but the expense is great if much record work is done. These bulbs cost about twenty cents each and are good for only one exposure. In effect they are a very powerful flash enclosed in glass so that there is no smoke or open flame. They are not recommended for posture record unless the clinic has unlimited funds. Four photo floods should be used for proper lighting of posture cases. These are arranged two on each side of the patient, one about 3 feet above the other, the lowest one to be about 18 inches from the floor, and about 4 feet from the patient. Reflectors with spring clamps at the back may be utilized. An upright square wooden post on a suitable base may be used on which to clamp the reflectors. Other arrangements may be used. A twin unit consisting of a collapsible stand upon which rests a cross bar with a photo flood and reflector at each end, may be purchased. Alterations may be necessary so that the cross arm and reflectors will be vertical instead of horizontal. Two of these units would be employed.

The background for posture record photographs should be portable. The most simple type is reversible and rolls upon a shade roller. It may be made of window shade material, and is white on one side and jet black on the other. The black side must not show shiny reflections when viewed from any angle. A background prepared in this manner is readily portable and, due to being permanently fastened to a shade roller, is free from wrinkles. In size it should be 7 feet long and 4 feet wide. The black side of the screen is used when white persons are photographed, and the white side with negroes or very dark skinned whites. This method of contrasting the background and patient offers the maximum contrast and outlines posture in a very dramatic manner. This method is not always followed by individuals engaged in posture record photography, but it should be, as it makes a much more easily read record. The danger of employing a white background with a white patient lies mostly in erratic exposure. Extreme over-exposure of the negative causes the patient and background to blend, so that the outline of the patient is lost. Even with normal exposure there is seldom sufficient contrast between a white background and a white patient.

To prevent grotesque shadows from appearing on the background, the patient should be placed either very close to the screen, or brought forward from the screen enough so that with the lights in the usual relation to the patient, the shadows fall outside the picture area. Shadows on the patient are caused by improper placing of the lights. Each pair of lights should be an equal distance from the patient, and an equal distance from each other. They should always be kept at this distance. Any variation will influence the exposure. If the lights are drawn away from the patient the exposure must be increased, but, if the camera is drawn away, and the lights remain in the usual position, the exposure will remain normal. A *slight* withdrawal of the lights will cause the light on the patient to *greatly* diminish, so care should be taken that the lights are always the same distance from the patient. If some special feature such as a funnel chest is to be brought out, the above lighting will not serve. It has been found that the most successful funnel chest photographs are made by placing one lamp on the floor about two feet in front of and pointing the light up at the patient. The other lamp is carried

back to about six feet from the patient and is kept at a normal height. Another method is to carry one lamp back six feet, and place the other lamp at the left or right of the patient, at the normal distance. This is called lateral lighting. The lamps placed twice the distance away serve to break up what would otherwise be, photographically, black shadows on the patient. The camera grossly exaggerates shadows. *If a shadow shows very faintly to the eye, the camera will register it as very definite.* This is a point to be remembered.

There are two types of silhouette prints being produced for posture record. The first type is simply a negative image exposed through the camera on a piece of sensitized paper called bromide paper. This makes a white silhouette against a theoretically black background. The procedure for making these prints is fairly simple. The material necessary consists of a camera, tripod, tracing cloth screen, and a lamp. It is essential that all light be excluded from the room, except the lamp being used back of the screen. If a view camera is used, double separators may be used in the camera back so that four 2½ x 3½ inch silhouettes may be made on one 5 x 7 sheet of bromide paper. The package of bromide paper, such as PMC No. 4, must be opened only in a red or deep orange light. The ruby bulb employed in most photographic darkrooms is commonly used. A place such as a closet with a tight fitting door may be employed as a darkroom for loading the holders with the bromide paper. These holders are the type called cut film holders. The top edge of the dark slide to the holder is white on one side and black on the other. The white edge should face out until the paper has been exposed in the camera. When the side is re-inserted in the holder it should be with the black edge out. If these paper silhouettes are to be shown to the patient immediately, apparatus for developing, fixing and washing the prints will be necessary. A 6 x 8 inch enameled tray for developing, another the same size for rinsing the print in water before fixing, and two 8 x 10 inch trays, one for fixing and one for washing the fixed print will be needed. The developer used may be the M.Q. tubes of developing powder obtainable at most drug stores and all photo supply stores, or any prepared developer may be used. The fixing bath may be purchased in powder form also. Ask for Kodak Acid Fixing Powder or its equivalent. Mix the developer and fixing bath according to directions on the packages. With the ruby light turned on, and all other light excluded from the room, remove the exposed bromide paper from the holder and place it in the developer. When development is complete (about 2-4 minutes), rinse and place it in the fixing bath for ten minutes, wash for 15 minutes in running water and dry the print between photographic blotters. The print may be shown to the patient after it is fixed, provided it is thoroughly rinsed to remove the surplus fixing bath or hypo. The ruby light is not needed after the print is in the fixing bath. White light may then be turned on. The second type of silhouette is made in the same manner as the usual photograph, on a negative. The set up for taking the photograph is the same as for the first type of silhouette. The negative must be developed, fixed, washed and dried. Then a contact print is made from the negative. This presents a black silhouette of the patient against a white background. The developing and printing is usually done by a commercial finisher of photographs. This is a much more permanent form of record than the direct paper method, as paper prints sometimes fade rapidly due to improper fixation and incomplete washing. Also duplicate prints can be made by the latter method, which is not possible without considerable trouble and expense by the direct method. The two methods are the same up to the time they are exposed and developed. The film method requires far less exposure than the paper method. It must be remembered that the silhouette is of value only in posture records. It is practically useless in Scoliosis records.

Sometimes a motion picture record is desirable. This is done quite simply with the 16 mm. size of apparatus. It requires considerable artificial light if any gait record is to be attempted. Four 1,000 watt lamps or six photo flood lamps are the minimum required for a gait record where the average eight year old child takes about ten steps toward and ten steps away from the camera, and the same numbers of steps laterally. A long room unencumbered by any upright building supports must be used. The space necessary is about thirty-five feet in length and 15 feet in width. The movie camera must have a lens whose largest opening is at *least* F: 2.8, a larger maximum opening would be better. If the lens does not open to F: 2.8, more than 4,000 watts of light will be needed. The camera should be either spring or electric motor driven, never a hand cranked machine, as an even speed of cranking is difficult to maintain by hand. The spring driven camera is ordinarily used and produces very satisfactory results. The lens in the movie camera, and in all cameras must be kept spotlessly clean. The best material to use in cleaning the lens surface is Japanese lens tissue. Optical glass is a great deal softer than ordinary window or plate glass, and scratches easily. A deep scratch on the lens means that the lens must be re-ground. The 8 mm. movie cameras are not as suitable for record purposes as the more common 16 mm. They will not project as large an image without having a granular, stretched appearance, and few lecture halls are equipped with projectors which fit them. As for color photography, there would seem to be no call for its use in posture record work. It requires much more artificial light than the black and white movies, and it is much more expensive. It might be used for publicity work simply because of its novelty, but even then the expense might not be justified. Slow motion movies may be made with some models of both Eastman and Bell and Howell cameras. They require either more light or a lens which has a maximum opening of F: 2. or larger and are of value in studying gaits. All movies must be made with the camera on a tripod.

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The Art of Mobilizing Joints

Roy F. Herrman, M. D.

No longer can a surgeon treat an injured extremity until that time when healing of the injured tissue is complete and then discharge the patient, to recover his function as best he can. True, in many cases recovery will be complete. In many more, however, the speed of recovery will be slow and the degree of recovery restricted because of lack of treatment and supervision of the process of mobilization of the affected adjacent joints. Mock,[1] in his chapter "Physical Therapy In Joint Surgery" states "Preservation of joint function following an injury to, or operation upon, a joint presents one of the commonest and often one of the most difficult problems in surgery. It is surpassed in difficulty only by the problem of restoration of joint function after it has once been lost."

The lay person who has been injured judges the speed of his recovery and the extent of his recovery by his ability to move the injured part. The percentage of functional loss estimated in industrial injuries and in liability cases with medicolegal aspects, is dependent, to a large extent, upon the degree of motion which has been attained. It is, therefore, of importance that the speed of recovery of impaired joint function and the ultimate degree of recovery be given sufficient consideration.

Restricted joint function, by reason of bony ankylosis and mechanical block, presents definite indications for surgical intervention and will not be considered here. By far the greater percentage of joints with impaired function is due to changes in the soft tissues which are immediately adjacent to the joint, as capsule or ligaments, or tissues directly related to its movement, as tendons and muscles. It is in the joint thus impaired that physical therapy measures are indicated, with few exceptions.

In order to intelligently understand why a joint cannot be moved through its full range of motion, one must be intimately acquainted with the anatomy of the joint and its allied soft tissue structures, namely: synovia, capsule, bursae, ligaments, tendons, and muscles. The joint capsule, the ligaments, the tendons and their ramifications which supply the supporting network of the muscle tissue, are composed chiefly of fibro-elastic tissue. An understanding of the common physiological and pathological changes which these tissues may undergo to restrict joint motion, is essential to proper treatment of the condition.

When a normal joint is immobilized, the capsule of the joint undergoes a process which may be termed physiological contracture in contradictinction to pathological contracture. Physiological contracture is a process of gradual shortening and gradual loss of elasticity of fibro-elastic tissue due to disuse. After a comparatively short period of immobilization a normal joint does not move with the same degree of ease as formerly but, with use, it returns again to its normal state with little difficulty. The process of physiological contracture, that is, shortening and loss of elasticity of capsule, ligaments, tendons and their muscle ramifications, is a process which is readily reversible.

The process of pathological contracture differs from physiological contracture, in that the process is not easily reversible and return to normal, following such a change, is slow. Certain clinical entities produce pathological contracture of fibro-elastic tissue. The most frequently encountered of these are chronic passive congestion and edema produced by either a dependent position or a constriction in the proximal part of the injured extremity, with a resulting impairment of the return venous and lymph flow. Inflammatory processes involving the fibro-elastic tissue, likewise, produce pathological changes which cause contracture of the fibro-elastic structures about a joint. This is evident in patients with a predisposition to chronic arthritic changes.

Just what occurs in the tissue cells of the fibro-elastic structures is not known. Their metabolism is affected, with a resulting change in their chemical and colloidal state. The clinical picture is one of thickening, shortening, and loss of elasticity. When joint function is impaired by this pathological process, restoration to normal cannot be accomplished by surgical measures but only through properly applied physical therapy measures.

Before attempting the local treatment of a stiff joint due to contracture, the patient should be instructed that the process of recovery is slow. He should be advised that his full cooperation is necessary to obtain a result and that frequent treatment and observation is essential. He should be told that the process is not painful except for that discomfort which is produced by active motion and which is under his control. This is very important for, not infrequently, these patients have gone through long periods of extreme suffering so that their pain threshold is low and they are very apprehensive of any effort to promote motion or correct deformity. The morale of the patient should be elevated by encouragement. In order to show the patient that there is improvement from day to day or from week to week, a careful graphic record should be kept. Either measurement of joint motion or a tracing of the angles of motion may be made so that, though the progress is slow, the patient may see with his own eyes that it is definite. This graphic record is also of importance to the attending physican and technician because he may see more easily the results of treatment and ascertain when there is no longer improvement in range of motion.

There are three factors of primary importance in the local treatment of impaired joint function due to immobilization and pathological contracture.

1. Measures which will improve the circulation to the involved extremity.
2. Gradual correction of flexion or extension deformity, if it exists, by fixed traction apparatus.
3. Muscle reeducation and therapeutic exercise. Forceful manipulation, either with or without an anesthetic, will traumatize the contracted tissues with further loss in flexibility. Though, initially, the range of motion may be improved after such manipulation, frequently after a lapse of a few days, solidification has again taken place and we find that the range of motion is less than it was before. Wilson,[2] in a recent address, emphasized this fact in relation to impaired function of the elbow joint following injuries. He emphatically denounces manipulation.

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Multiple devices have been devised by men, to be applied to various joints of the body, whereby, either flexion or extension deformity can be gradually overcome. Kulowski,[3] Campbell and Mitchner,[4] Cravener,[5] Flagstad,[6] and Goldthwait,[7] and numerous others have devised mechanical appliances for the gradual correction of various joint deformities. If the correction is made slowly without exciting a local reaction in the contracted tissues over a period of days or weeks, the contracted portion of the capsule or the contracted ligaments, tendons and muscles may be stretched to their normal length. During this process of gradual correction, the apparatus should be removed at frequent intervals so that physical therapy measures, heat, massage and active exercise may be applied. This is the principle which has been widely circulated and we find that Meyerding,[8] in his recent article on "Volkmann's Ischemic Contracture," advises conservative treatment of contractures unless there is definite indication for surgery.

An injured extremity which has been immobilized with a resultant muscle atrophy, circulatory deficiency and impaired joint function presents a definite indication for the use of various thermic agents. These measures may be varied with the part that is treated and with the apparatus available. Radiant light and heat, diathermy, whirlpool baths or paraffin baths may be used. The use of the paraffin bath in elevating the temperature of the hand with its multitude of small joints, probably surpasses all other measures of treatment in this respect. Briefly may be mentioned the value of proper massage following the elevation of temperature of an extremity. Here again, the use of gentle massage where it is indicated and of more vigorous massage when it is tolerated is an art which cannot be described in words.

To complete the process of treatment, muscle reeducation and therapeutic exercise are of equal importance. Mackenzie[9] has clearly shown the importance of reeducation of the muscles of the shoulder following inactivity of that joint. In the process of reeducation, assistive exercise, free exercise and resistive exercise should be applied selectively to each muscle or group of muscles, as their state of function may indicate. In the treatment of a single joint, assistive exercise may be indicated for one group of muscles which are most weakened and atrophied. An adjoining group of muscles may be able to perform their function of moving the joint if the extremity is merely placed in a position where the force of gravity is eliminated. Still a third group, about that same joint, which are more powerful in character may present indications for resistive exercise in order to bring their function toward normal. Here again, the use of the various degrees of active exercise to mobilize a joint must be applied with an art, if maximal results are to be obtained.

Conservative measures of treatment are indicated when joint function is impaired by physiological or pathological contracture. The proper application of simple, accepted, and well known principles of physical therapy may be called the art of mobilizing joints.

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Teaching the Spastic to Feed Himself

Alma M. Orneas

Perhaps one of the biggest problems one faces in the education of the spastic child is the eating problem. After a number of spastic children in the Spalding School had been segregated for academic training, we found that a large number of them were unable to feed themselves. On further checking, we found to our amazement that nearly all of those children could not bite correctly, chew easily, or handle liquids comfortably. Apparently they had been fed all their lives by some helter-skelter method. As long as some food reached the child's stomach no attention had been paid to the manner in which it had reached there.

Together, the teachers of the spastic group attempted to work out some plan whereby these children would get not only enough to eat, but also would progress in the physical abilities necessary to eating and self-feeding. First of all, we segregated the group at noon and provided a separate, supervised lunch period, as it was evident that the group had to have intelligent direction. Each case was treated individually. Although progress was, and is slow, we feel that our results have shown that the time and energy has been profitably spent.

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The simplest way to describe the methods used is to take a typical case. R—— was a spastic child, a quadraplegia and very athethoid. He had been fed all his life by some member of the family. When food was brought to his mouth the stimuli caused his whole body to move in extraneous movements. The trunk stiffened, the head jerked back, and the arms and legs gyrated like windmills. His face became distorted by the contractions of the facial muscles. Obviously, the first thing to do was to eliminate as much and as many of the extra movements as possible. The child was very capable mentally, and when we explained what we were trying to do, he gave us the fullest co-operation.

As the first step in teaching R—— to eat, he was told to relax as much as possible. While he was in that condition food was brought to his mouth easily and quietly. If the extraneous movements started up, the food was taken away, and after he had composed himself, another try was made. By persistent effort and practice the child learned to control these movements to a reasonable extent.

We then started on the problem of the actual eating. The patient's teeth did not approximate correctly; consequently, he was unable to make a clean bite. Those

who had fed him had broken up his bread into small bits and had popped the pieces into his mouth as the opportunity presented itself. We showed him how his teeth would have to meet if he wished to bite well. The speech teacher helped him and gave him exercises to aid him in overcoming his difficulties. R—— learned how to make almost perfect bites in a remarkably short time. This habit became fixed quicker than any of the other new habits we tried to set up.

After he had learned to bite we were faced with the problem of his taking food off a spoon or fork. Two things complicated this problem, the tongue and the lips. As in so many spastic cases, the tongue was spastic; it did not move easily from side to side, but invariably pushed out of his mouth. The movement was practically a lapping one, and what food he did get into his mouth was brought there by this peculiar lapping movement. The lips played no part at all, and could not even assist in holding the food in the mouth. As the lips and the tongue are so closely correlated in the process of eating, we had to train them as simultaneously as possible. We constantly called attention to his tongue. We had him practice opening his mouth, and at the same time attempt to keep his tongue inside and behind the teeth. Often we had to hold his lips together to give him the kinesthetic sense of the movement. This has always been one of the most difficult things to teach our spastics.

The next step was to teach him to drink milk from a cup. This child seemed to have an extraordinarily difficult time to hold his lips quiescent while milk was poured between them. It took much demonstration and explanation to show him that the cup only rested on his lips, and that the milk was poured into his mouth by the tipping of the cup and not by the biting of the edge of it. He also had the habit of holding a mouthful of milk in his mouth without attempting to swallow any of it. Eventually some of the milk would trickle down his throat, while the greater part of the mouthful spurted out of his mouth and ran down his chin and neck. We solved this difficulty by pouring only enough milk for one gulp or swallow into his mouth. After he became accustomed to accommodating this amount, it was increased to approximately two swallows. He finally learned how to drink, using a succession of swallows.

Although by no means perfect or proficient in eating abilities, the child was now ready to tackle the problem of handling utensils. The first thing to do was to find a table and chair that were comfortable for him. To make him feel more secure we tied him in the chair. Anything that seemed to make him more at ease was done for him; thus, he was able to devote his entire energy and thoughts to the problem of eating. To even consider using standard plates was out of the question. We used a shallow, square, tin cake pan which was held firmly in place by four wooden corners fastened to the table. This child did not need a special spoon, but for some children we do use spoons that have elongated, shaped wooden handles. The patient is often able to hold and grasp this especially shaped spoon much easier than he can the regulation, standard type.

From this point on, R..... progressed rapidly in feeding himself. The physical therapist gave him exercises that helped him to master the movements necessary to handling the spoon and bringing the food to his mouth. His family carried on at home and co-operated fully. When I last saw him I sat with him at his family dinner table. His mother had found a child's plate that fastened to the table by means of a clamp. He ate cleanly enough and so well that it caused an outsider no embarrassment to sit at the same table with him. The only thing he could not do was to hold his cup of milk without assistance. He has since left our school, and we have no further record of his progress.

This case is only one of many with which we have had to deal. Some children have been put back into regular graded classrooms of the school, and have been able to take their places with the rest of their classmates in the school lunchroom. Others promoted to other rooms still come back to our supervised lunch period to eat until they become dexterous enough to go to the regular lunchroom.

No two problems have been exactly alike, but there has been a similarity in the cases that has aided us in solving their difficulties. We have found that practically all cases have unnecessary extraneous movements that hamper them. It is up to the director to identify these movements and eliminate or correct them. The tongue seems to be a major offender in the matter of wrong movements. The child must practice carefully and consistently in an effort to learn the correct tongue movements and to control the lips. As the muscular inabilities of the lips cause much of the drooling that handicaps spastics, the training of the lips will tend to correct that fault also.

We would say, "Adapt the utensils and equipment to the child—not the child to the equipment." Make eating as pleasant and as easy for him as possible. As he grows more and more proficient, gradually remove the artificial aids. Do not hesitate to use any contrivance that will help him over the rough spots. Do not worry about the mess he makes while learning. If necessary, put an oilcloth under his table to protect the floor, and let him wear a cover-all or smock. Be sympathetic and patient with the child, for if he could feed himself, rest assured he most certainly would. Drill and concentrated effort for neatness are the last things to be considered when teaching a child to feed himself. Most children will strive to attain a level of proficiency and neatness that will enable them to sit at the family table and participate in the social life that revolves about the family meal.

Be sure to have the child's family co-operate and carry on at home what you are trying to do at school. The training and education of any spastic child is a twenty-four hour a day job. One thing in our plan that has helped tremendously is that all the teachers in any way connected with the group do their part in the training of the children. The speech teacher works on the problem of the tongue and lips particularly. The physical therapist bends her efforts toward eliminating undesirable movements, and toward developing purposeful movements, such as picking up a piece of bread and carrying it to the mouth. The occupational therapist, in addition to contriving special devices to aid the child, gives part of her time to the direct supervision of the lunch.

Any time devoted to teaching a child to feed himself, even if a portion of that time has to be taken from his academic periods, is worth-while. The main purpose of education is to enable a child to take his place and to live on good terms and in pleasant relationship with other people. His social adjustment is as necessary, if not more important than his mental adjustment. By making it possible for a child to enjoy normal family life, and to increase his independence of outside aid, we are giving him an opportunity to develop satisfactorily a wholesome attitude toward the world about him.

Fever Therapy

A Simplified Technic for Inducing Fever by Electromagnetic Induction

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The management of the patient should begin as soon as hyperpyrexia has been prescribed. Unfortunately, hyperpyrexia is too frequently regarded merely as a worthy therapeutic experiment and the patient is permitted to decide whether or not he wishes to "try one or two treatments and see if they do any good." Because of such apparent lack of confidence on the part of the physician in the therapeutic value of artificial fever it is only natural that patients easily become discouraged, and seldom submit to more than two treatments. When the referring physician emphasizes too greatly the discomfort of artificial fever we find that the patients become apprehensive. These cases invariably offer great difficulty in management during treatment; any amount of assurance will not allay their unwarranted apprehension, and even sedatives and narcotics do not satisfactorily quiet them.

In all cases in which the patients have been told that treatment with induced fever promises improvement, and that while it is not entirely without hazard, in qualified hands the dangers are quite remote, it has been our pleasant experience to have cooperative patients who are easily and satisfactorily managed. These patients do not have a period of marked excitation; they are easily controlled with sedatives, they show a slower and a steadier pulse rate, they have a smoother, quicker rise in temperature during the induction period; and the fever is more easily sustained during the entire fastigium.

In selecting cases for fever therapy we must not only ascertain whether fever may benefit the pathologic process, but also whether there are contraindications to the treatment. A preliminary electrocardiographic examination and a chemical examination of the blood are good practice. If the fasting blood sugar level is low, it is advisable to do a glucose tolerance test in order to determine the possibility of impending hypo-glycemic shock. When fever treatment is advised for a patient who has a slight contraindication care should be taken, if the patient is informed, not to incite fear. The mental preparation of the patient determines the difficulty or ease of management during treatment.

The patient should be instructed to make sure of an adequate fluid intake during the twenty-four hours before treatment. It is advantageous to administer ten to fifteen grams of sodium chloride during that time; this is especially advisable in the hypoadreniac type of patient who presents a slow pulse, hypotension, easy fatigability, and subnormal temperature. In cases of the latter group it is often wise to give not only the salt during the twenty-four hours preceding the treatment, but also several hypodermic injections of adrenal cortex extract during the week preceding the treatment. If help from this medication is evident it should be continued between fever treatments. Another preliminary measure is to evacuate the large bowel by enemata; this insures greater comfort during treatment and obviates the necessity of a bowel movement during the fever treatment. If a laxative or cathartic is required it should be given early so that all action has subsided before treatment begins, since an active bowel interferes with the successful management of the patient. The patient should have a good night's rest before treatment; if necessary, a hypnotic or sedative should be given. It is well to use a drug for this purpose which may be used as a sedative during hyperpyrexia in order that any idiosyncrasy to or untoward effects of this drug may be observed.

If the patient's general treatment includes the use of medicaments there are certain drugs the use of which should be discontinued for several days prior to fever therapy. Hyocine or in fact any drug of the belladonna group will inhibit perspiration and thereby prevent the normal loss of body heat by evaporation of perspiration, thus seriously impairing the proper functioning of the heat regulatory mechanism. A sudden, almost uncontrollable rise in temperature to 107° F. or higher may result if these drugs have been used. Continuous cold sponging of the entire body for an hour may not reduce the temperature appreciably; continuous cold baths may be equally ineffective. Care should be taken to prevent the possibility of the reaction by eliminating such medication.

On the morning of the day of treatment the patient should eat a good breakfast since solid food is not administered during the period of pyrexia. A suggested breakfast is: One-half grapefruit, a generous portion of cooked cereal, several strips of bacon, one or more eggs, a glass of milk, and coffee if desired. This breakfast should be eaten from one to two hours before treatment is instituted.

As soon as the patient is admitted fifteen to thirty grains of elixir of pentabromides is administered; after thirty minutes this dose is repeated. We administer bromides because we find them tolerated better and productive of fewer untoward effects than other drugs. The patient should be placed in the treatment bag soon after his arrival. If allowed to sit around and wait, patients become nervous and fearful, and are likely to exhibit undue restlessness during the induction period.

The technic of inducing fever employed by us is simple. The patient is treated in an ordinary hospital bed prepared with a canvas support in place of the springs. (Fig. 1). The use of a bed conforms with the patient's hospital experience and reduces apprehension to a minimum. The removal of the springs permits the use of the electromagnetic field under the patient as illustrated in Fig. 2. The standard twelve foot cable is formed into a single elliptical loop about four feet long and one foot wide. This loop is positioned on the mattress (which must not be of the inner spring type) so as to extend approximately from the shoulders to the calves of the average adult patient. Ample padding is used to build up the areas between and around the loop till the surface is level with the cable. The entire assembly is covered with a full inch of padding (Fig. 3). Padding will compress under pressure. The stipulated thickness of one inch is the thickness that must obtain when the patient's weight is resting on the padding. The treatment bag is

Chicago.

Fig. 1
Hospital bed with canvas support in place of spring.

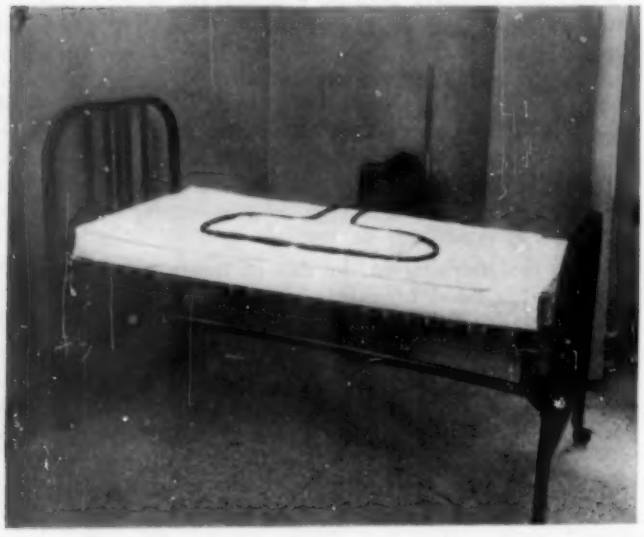

Fig. 2
Coil in position on mattress.

Fig. 3
Padding covering coil.

placed on this pad, the patient inserted and an upholstered cradle placed over him to support the weight of the bag and additional insulation (Fig. 4). The zipper of the treatment bag is now closed (Fig. 5). Additional insulation such as a rubber sheet and several blankets is now added (Fig. 6).

The advantages of this technic are a more general distribution of the energy input into the patient and the removal from the patient of the oppressive weight of the treatment bag and blankets. These advantages result in a more satisfactory and comfortable treatment for the patient.

Soon after treatment has been started we give the patient about three grams of sodium chloride with a glass of hot water; we find it is preferable to administer the salt in a concentrated solution and give the patient clear water as a wash-down. We have adopted this procedure to stimulate an adequate consumption of fluid. This salt administration is repeated no less than three times during treatment. Ten to fifteen grams of sodium chloride during the treatment usually suffices. Sufficient fluid intake is of prime importance. It must be adequate to permit free perspiration and still prevent undue concentration of body fluids. Fluid should be given frequently and in small quantities. If a patient is allowed to drink large draughts at one time it leads to gastric discomfort which increases the general nervous attitude. A patient will imbibe several liters of fluid during treatment.

When the patient expresses a desire for any certain beverage we grant the request, if possible. This satisfies the patient and promotes cooperation on his part. We employ orange juice, milk, tomato juice, coffee, meat broth, water, etc. Citrus fruit juice should be used in moderation to avoid too great an increase in the alkaline reserve of the blood. Fruit juices are tolerated well if diluted with water. On the contrary it has been our experience that undiluted fruit juices may cause nausea and vomiting. Iced beverages should be avoided since they usually cause gastric distress, nausea, vomiting, and cramps. Chilled drinks also interfere with the rise and maintenance of the temperature. Hot drinks aid in the management of the treatment. A bowl of hot meat broth containing a little rice or a few noodles allays hunger very well.

Toward the end of the period of induction the restlessness and discomfort of the patient often becomes quite marked; at this time it is our practice to give Pantopon grain 1/3 hypodermically. This narcotic usually gives the patient restfulness for the remainder of the day. We do not use morphine sulphate because of the frequent gastric disturbance we have encountered with its use.

The nursing care is of great importance. The first requisite is constant attendance. The average patient, if left unattended for more than five minutes, becomes fearful, anxious, and restless. This restlessness manifests itself in an increase in the pulse rate which invariably subsides on the return of the nurse. It is well if the nurse interests herself in the patient's vocation or avocation in order that a conversation of interest to the patient may be carried on. This serves to divert the patient's attention from the treatment. The patient's face should be kept wiped free of perspiration. This is best done with a damp cloth, not a dry one. The trickle of perspiration on the nude body is irritating and the patient should be given a damp wash cloth inside the bag with which he can wipe himself.

Not infrequently a patient will complain of a vague aching distress in the lower abdomen; this is usually due to a distended urinary bladder. During hyperpyrexia

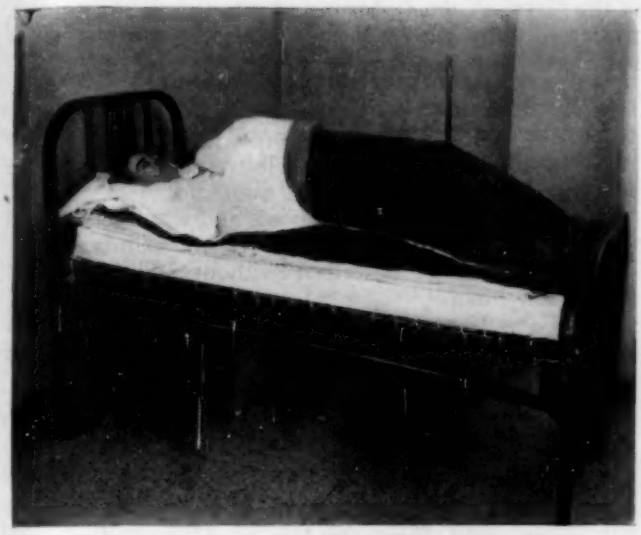

Fig. 4
Patient in treatment bag with cradle to support bag.

Fig. 5
Treatment bag closed.

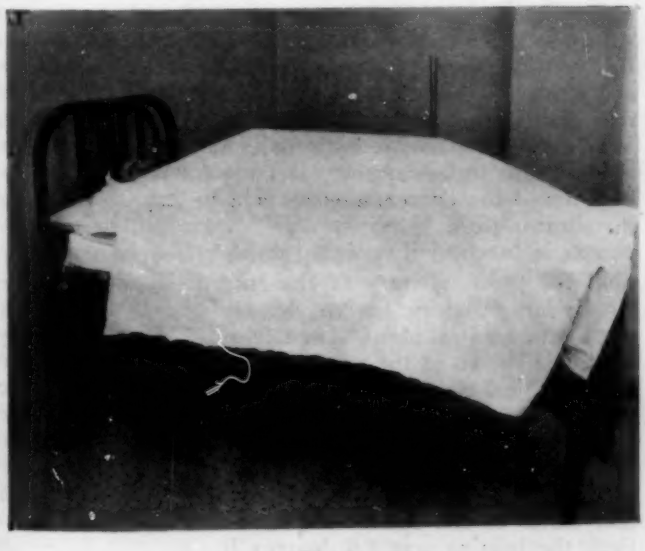

Fig. 6
Additional insulation in place.

patients may not have a normal bladder sensibility and the urge to urinate may not manifest itself. It is important for the nurse to remember this fact. Voiding of urine will promptly relieve distress due to this cause.

Friends or relatives should not be allowed to remain during treatment since they do not understand the procedure and often disturb and worry the patient Quiet should be maintained and a slightly darkened room is conducive to restfulness. The physician referring the case for fever therapy should visit the patient during the treatment; if possible, during the latter part of the period of induction when the patient is most in need of confidence and assurance. No attendant can take the place of the personal physician in this regard. The physician under whose supervision treatment is given should visit the room frequently during the first several hours and pass audible comment each time regarding the splendid manner in which the temperature is rising; the strong,

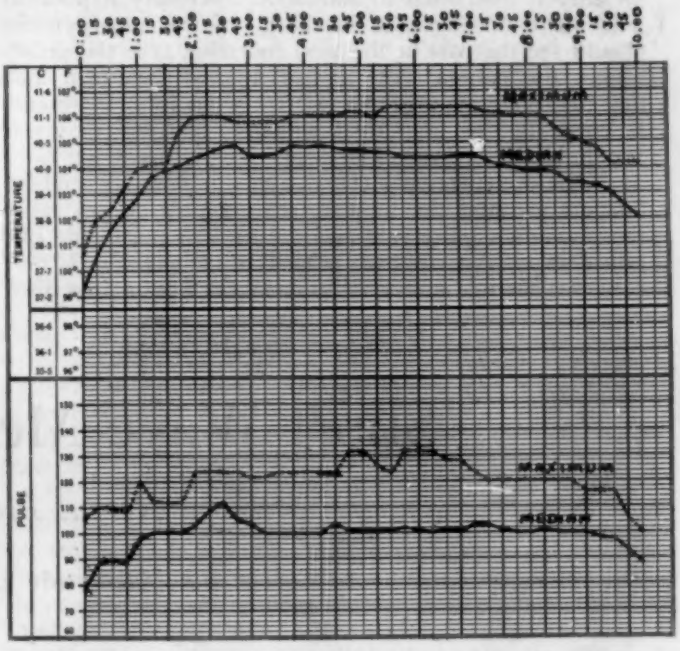

Fig. 7
Maximum and median rectal temperatures and pulse rates obtained in a series of eight cases.

regular pulse signifying that the patient is doing well; the satisfactory progress of the treatment, etc. All this is important in the psychic management of the patient.

The nurse must remember to do everything which will reduce loss of heat from the patient. Adequate insulation must be maintained around the neck; the patient frequently makes an opening here by the movement of his arms or by willfully trying to open the enclosure in order to feel some cool outer air, Care must be taken in opening the bag for obtaining rectal temperatures with a clinical thermometer. When a urinal or bed-pan is introduced the vessel should be preheated both for the comfort of the patient and to minimize heat dissipation.

The temperature, pulse, and respiration should be recorded every 15 minutes. Any sudden change should be recorded and immediately reported to the physician in charge. The nurse should be thoroughly acquainted with all of the warning signs which indicate that the temperature should be lowered or the treatment terminated. It is important in an emergency to remain calm and confident in order that the patient may not be frightened by the excitement of the attendants.

From the termination of the period of hyperthermia

approximately half an hour is necessary for reduction of temperature and removal of the patient from the treatment bag. Care should be taken not to expose the patient or allow him to chill at any time. Additional insulation such as rubber sheeting and blankets is removed and the zipper of the treatment bag completely opened. The patient's arms are taken out and a gown is put on. The entire bag is then removed and the patient is covered with preheated sheets and blankets, care being taken to avoid exposure. A sheet and two blankets are usually sufficient covering during this cooling process. After about thirty minutes the body temperature has dropped sufficiently to allow the patient to be transferred to his room for the night. It is advisable to keep the patient in bed over night before being released. The patient should be given something to eat when he reaches his room. He should be told that he will probably fall asleep at his usual time and if there is any insomnia the nurse on duty is instructed to administer necessary hypnotics. The nurse or physician in charge of the hyperpyrexia should see the patient the next morning, take the pulse, assure the patient that he had a good treatment and that his cooperation is appreciated. Appointment should be made for the next treatment, and instructions given for the preliminary measures previously discussed.

The accompanying chart, Fig. 7, shows the highest temperature and the mediam temperature curves; also the maximum pulse rate and the median pulse rate obtained in eight treatments with this technic. It is evident that there is a very satisfactory rise and maintenance of the fever. A most pleasing observation is the regular, moderate pulse rate, which in our experience is lower than with other methods in current use.

SUMMARY

1. The technique described provides a method of inducing artificial fever by electromagnetic induction which is simple, efficient, and safe.
2. The fever is readily induced, and when the desired temperature is reached is readily maintained by the insulation described without additional electrical input.
3. The pulse is desirably regular and moderate in rate, even the maximum pulse rates obtained in this series being entirely satisfactory.
4. The requisite of safety is present, and if the patient lies upon sufficient terry cloth to diffuse the perspiration during the period of induction there is no possibility of burns.
5. If proper psychic preparation of the patient has been made, the patient is easily controlled with small or moderate amounts of sedative or narcotic.
6. The exhausting effect of the treatment is minimal and patients are in surprisingly good condition on the following day.
7. The ease with which the treatment is given and the absence of exhaustion the following day make for better cooperation on the part of the patient and assure the satisfactory completion of the required number of treatments.

Short Wave Medical Diathermy

Recent Investigations

Gertrude Beard, R.N.

Short wave medical diathermy is the production of heat for therapeutic purposes in the body tissues, by means of short wave diathermy machines. This heat is insufficient in amount to produce temperatures high enough to destroy the tissues or impair their vitality.

Short wave diathermy can be produced by two distinct types of machines, the one by vacuum tubes, the other by a spark gap. The energy is applied to the body by flat metal electrodes highly insulated, or by insulated coils. The frequency of oscillations may be from ten million to one hundred million cycles per second.

There are two methods of applying the energy from a short wave apparatus: 1, by means of condenser type electrode; or 2, by means of electromagnetic induction. In the condenser electrode method the local part to be treated is placed between the electrode plates which form a condenser, the tissues being the dielectric. The metal electrodes are not in direct contact with the skin as with the conventional medical diathermy electrodes. These electrodes are metallic plates incased in an insulating material such as rubber or felt to prevent the current from arcing from the metal to the skin. When applied they are usually separated from the skin by one-fourth inch layer of toweling or other material that will absorb any accumulation of moisture. The presence of excessive moisture may produce burns.

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The usual methods of applying these electrodes are (a) to place an active or small condenser electrode over the part to be treated with a large dispersive electrode on the opposite side so that the current will be concentrated to the area under the smaller electrode; (b) electrodes of equal size on opposite sides of the area to secure as much as possible heating of the tissues between th electrodes; or (c) double cuff electrodes. These cuffs are made to encircle an extremity and are placed so that the part to be treated is midway between them. When using the double cuff on joints of an extremity it is important to be certain that the joint is extended. If it is flexed the current density will be much greater in the shorter path.

It is believed that with the high frequency electric field the point of entry of the current should be sufficiently large that the current density will not be so great as to produce heat above skin tolerance. The importance of this is shown in the work of Mortimer and Osborne[1] in which pad electrodes of equal size placed on opposite sides of the thigh produced, in eight subjects, an average rise of 1.2 degrees F. one and one-half inches below the skin surface in the quadriceps extensor muscle; whereas with cuff electrodes wrapped around the thigh proximal and distal to the thermocouple, other conditions identical, the heating was 4.8 degrees F.

It is believed that in this method the heat is produced

by the passage of alternate currents of high frequency through the tissues between the two electrodes, and yet it may be due to dielectric losses in the condenser field.

The second method of heating tissues by short wave medical diathermy is by the so-called electromagnetic induction. By this method the energy is applied to the patient by means of a flexible, heavily insulated cable which is wound around the part to be treated in the form of coils or loops. The part to be treated is separated from the coil or loop by several layers of absorbent material for the same purpose as mentioned under the other method. Experiment has shown that in this method the energy made available for heating before the patient's skin tolerance is reached is greater than with the short wave electrical field method.

The exact physical phenomena taking place within the tissues, which causes the heat to be generated, has not been fully explained. It is believed, however, that within the helical coil, through which the high frequency current from the device flows, there is set up an alternating magnetic flux, having the same frequency as the current in the coil. If a conductive material is placed within the coil an electromotive force will be induced in it. As a result of this induced voltage, eddy currents of the same frequency as the existing current will flow in the conductive material, generating heat in the tissues.

At Northwestern University Medical School we have conducted three series of experiments to determine the ability to heat the tissues of the human thigh. A total of twenty-eight experiments was made on medical students who volunteered as subjects for this work. The temperature readings were measured by a thermocouple. The thermocouples were made of copper and constantine wires (28 gage Leeds-Northrup double cotton covered), soldered into the tip of a 16 gage lumbar puncture needle. The thermocouples were connected to the potentiometer (Leeds-Northroup portable precision type) through parallel double pole switches, a method that facilitated rapid reading of the individual couple. The thermocouples were calibrated against a Bureau of Standards calibrated thermometer with scale division in one-tenth degree F. Since the thermocouple itself is affected by the high frequency currents they were removed from the field during the passage of the current. Two cannulae of nonmagnetic, nonconducting substance were inserted into the thigh under aseptic precautions. One cannula was placed in the subcutaneous tissues and at a distance of one inch the other was inserted one and one-half inches into the quadriceps extensor muscle. The thermocouple needles were introduced through the cannulae and temperatures of the subcutaneous tissue and of the muscle, as well as of the skin and mouth, were noted. After the thermocouple needles were removed, a twenty minute clinical application of short wave diathermy was made and temperatures were again taken immediately after the current was discontinued. The intensity of the current was governed by the patient's skin tolerance. The subject agreed to endure the maximum amount of current possible without discomfort. Insulating material between the skin and electrodes was used in amounts as recommended by the manufacturers of the machine used.

In these experiments it was found that the closer the electrodes were placed to the skin the more nearly the short wave diathermy resembled conventional diathermy. The heating of the skin and tissues near the electrode was found to be the greatest. Therefore, to obtain a more nearly uniform heating, considerable insulating material should be placed between the electrodes and the skin. One or more layers of quarter inch wool felt with several layers of absorbent toweling in contact with the skin was found to be a satisfactory method of insulation.

These experiments also demonstrated that the sensation of temperature experienced by the patient is no indication of the amount of heat being developed in the deeper tissues. It was shown that, with short wave apparatus utilizing condenser type electrodes, excessively high superficial temperatures may be obtained, yet only a negligible increase in temperature may be obtained in the deep tissues.[2]

The relative efficacy of the various methods of applying short wave diathermy to heat deep tissues of the human thigh, in identical experimental conditions was found to be: 1, cable and coil, or double cuffs, 2, condenser type electrodes, 3, glass or composition, air separated electrodes.

It has been shown that there is a selective heating of electrolytes in high frequency fields. This has been demonstrated for dead tissues and on this basis claims are made that there is a selective heating of tissue by short wave diathermy.

In the heating of dead human tissues, it is possible to obtain different heating effects for different wave lengths, but there is considerable difference in the opinion of the investigators about the heating of fat and muscle. Schliephake notes that the maximum heating of fat was at 14.5 meters, and the minimum at 7 meters. Gebbert found no difference betwen 3 meters and 16 meters. Bachern found the most heating at 5 meters. In the heating of muscle, Schereschewsky found that there was a greater heating at 4.69 meter wave than with one meter. Gebbert found no difference between 3 meters and 16 meters. Schiephake noted that the maximum heating of muscle was at 14.5 meters. Holyer and Weissenberg found more heating of muscle at 20 meters than at 10 meters.

It would be theoretically possible to have selective heating of tissues by short wave diathermy if we knew the conductivity and the dielectric constant of human tissues. Unfortunately the constants for most tissues are unknown and what has been claimed is very questionable. The conductivity of most single tissues is shown to vary greatly. In addition the circulation of the blood in different tissues varies with many factors. Therefore, the selective heating of tissues seen in dead tissues does not apply to living tissue.

In one series of our experiments the relative efficacy of various short wave diathermy machines was tested for their ability to heat the tissues of the human thigh.[2] These machines comprised short wave apparatus, utilizing spark gap and vacuum tube oscillating circuits and a vacuum tube oscillator employing electromagnetic induction for heating tissue. The temperature rise obtained with these machines in the deep tissue of the thigh ranged from the most efficient (electromagnetic induction) with an increase of 4.75° F. to the least efficient (one of the condenser type short wave apparatus), with an increase of 0.5° F. By the use of cuff electrodes greater heating can be obtained in the deep tissue using short wave apparatus than with condenser type plate electrodes. Cuffs can conveniently be applied to extremities, but are difficult, if not impossible, to apply to the shoulder, back or pelvis. The heating obtainable in the pelvis by means of short wave diathermy has also been investigated.[3] These studies showed that the electromagnetic induction produced the greatest increase in the temperature of the vagina and rectum and that treatment by this method was the most comfortable to the patient.

Another study was made to determine the efficacy of heating living human fat and muscle. In this series were used: firstly, condenser type electrodes cuff technic in a field of 6, 12, 18 and 24 meter wave lengths; secondly, electromagnetic induction in a field of 12, 18 and 24 meter wave lengths with coil technic. The cuff electrode of the condenser type and the coil of the electromagnetic field method were selected because previous work by Mortimer and Osborne showed them to be the most effective in heating tissues.[1]

This study showed the following temperature increases in the heating of live human muscle. Condenser type electrode, cuff technic, six meter wave length increased from 99.9 degrees F. to 106.5 degrees; eighteen meter from 100.2 to 106.5; eighteen meter from 100.0 to 105.8; and twenty-four meter from 99.5 to 104.8. The electromagnetic induction, coil technic, twelve meter wage length increased from 100.0 degrees F. to 107.0 degrees; eighteen meter from 98.0 to 107.0 and twenty-four meter from 100.0 to 106.2.

CONCLUSIONS

From these studies the following conclusions can be drawn: (1) The relative efficacy of the short wave diathermy machines and technics for heating living human muscle at a depth of one and one-half inches is (a) electromagnetic induction, coil technic, (b) condenser type cuff electrodes, (c) condenser type plate electrodes. (2) There seems to be no advantage of any one wave length over another for heating living human tissues.

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Practical Suggestions for Foot Exercises

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In teaching exercises for weak or painful feet it is most important that the exercise program be planned so that the patient will learn the best mechanical use of the feet. If the exercises can carry over into ordinary everyday walking, or if they can be done while standing or sitting, and with the shoes on, they have more practical value than if they can only be done in an exercise period.

It is essential that the patient, especially the adult patient, understand something of the structure of the foot, the part played by ligaments and muscles in supporting the structure, and the mechanics of the foot.

If there is limitation of motion in any of the joints of the ankle, foot or toes, exercises to increase motion are indicated. These include the many familiar non-weight-bearing exercises, such as toe flexion (picking up marbles with the toes), inversion, dorsal and plantar flexion, etc. In extreme cases massage and stretching may be indicated and the patient should be instructed in carrying out these procedures daily.

An orthopedic examination should be made before treatment is instigated. Correction of shoes should be prescribed by the orthopedist.

Weight bearing exercises are preferably done with shoes on, but it is necessary to have the patient learn to do the exercises without shoes or stockings in order to learn how to use the various muscle groups. Sandals with correction similar to that of the shoes are excellent for teaching purposes.

If weight bearing is definitely contraindicated, part of the routine may be done in a sitting position, later progressing to the standing position.

The weight bearing exercise is done as follows: Standing with weight equally distributed on three points (1) head of first metatarsal, (2) head of 5th metatarsal, and (3) heel. Keep the toes extended and pull them toward the heel, pressing the toes into the floor. The weight must remain equal on all three points and the head of the first metatarsal must not come off the floor. This movement should visibly shorten the length of the foot, deepen the longitudinal and transverse arches and bring about good alignment of the ankle joint. The balanced action of the anterior and posterior tibials, the abductor hallucis, toe flexors and peroneals, reinforces the ligamentous support of the foot. If, on the contrary, the weight is thrown on the outer border of the foot, with the toes curled under, the toe flexors and tibials may be strengthened, but the position is not one from which a good weight bearing position may be learned, and the action of the peroneous longus on the arches of the feet is completely overlooked.

The exercise should be done in front of a mirror in two positions: (1) Ventral view of foot; (2) Medial view of foot.

For some patients the effect of the exercise is more graphic when done as follows: "Puppet walk." A small piece of a tongue depressor with a string tied to it is placed under the toes, the string passing between the great and second toe and held in front of the patella. The alignment in the given case is analyzed in relation to the so-called normal alignment and is essentially only a part of the alignment of the whole body. Walking toward a mirror with these strings in place while attempting to maintain the alignment is a good exercise.

Once the use of the muscles in this way has been acquired the patient should consciously repeat the exercise each day until it becomes incorporated into his everyday weight bearing activities.

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Massage As a Profession for the Blind

Thelma Pierce

The "handicap of blindness" transformed into an asset. . . . Impossible you think, but here is one profession where it can be accomplished provided the masseur or masseuse has all the other necessary qualifications. Other countries have recognized for many years the aptitude for massage of these people living in a world interpreted by touch. As early as 850 A. D. there was established in Japan a guild of masseurs consisting almost solely of blind people. Here this work is still considered one of the best professions for the visually handicapped. The Japanese consider their skill in the manipulation of muscles and joints to be very great and their services are in universal demand. The guild of masseurs includes men and women who make their rounds either early in the morning or late in the evening. They make their presence known by blowing on small whistles as they enter the streets. In the early stages these Japanese masseurs had little background but now four to seven years are spent in preparation. Subjects such as morals, physics, chemistry, outline of medical science (anatomy, physiology, pathology and hygiene) are included in the course in addition to the regular literary subjects.

England, too, has recognized the value of fingers and hands trained since babyhood in delicacy and sureness of touch to the field of massage. The National Institute for the Blinds' School of Massage was founded in 1915 but recognition should be given to the much earlier work which began in 1900 when the London In-

stitute of Massage was founded to train blind masseurs and masseuses. It did valuable pioneer work, but of course the professional standards of that time should not be compared with those of the present. Now, to be admitted to the Massage School a blind person must meet the rigid requirements of physical fitness, educational fitness, personality and prospects. Only those of exceptional calibre are accepted for the two-year course and then only after a trial period of two months. At present, the Massage School occupies new quarters at the National Institute for the Blind, 224 Great Portland Street,

London, W. I. This building was opened in 1932 by Dr. Helen Keller and includes gymnasium offices, lecture room, library and rest-room. There are especially constructed articulating skeletons, showing how a joint may become dislocated, also mannikins showing the deep structures and raised diagrams for the students to use during lectures.

Not less than 118 hours of theory and 300 of practice are spent in learning electrotherapy. The examination in this part of the work includes faradism, galvanism, sinusoidal current, radiant heat, infra-red rays, diathermy and high frequency. The electrical instruments are designed so that the blind operator can measure the strength of the current and each indicator is marked in Braille. The blind student during his course gives treatment at two of the leading London hospitals and at an Evening Electrical Clinic held at the Massage School.

In 1919 a library was formed for the use of the blind students of massage and for those in practice. Today the library consists of 312 volumes consisting of standard works on massage, medical gymnastics, anatomy, etc. In order to keep the blind masseur up with the times a monthly magazine, "The Massage Journal," is published in Braille.

In addition to the examination in electrotherapy there are examinations in massage and remedial exercises. These are given by the Chartered Society of Massage and Medical Gymnastics.

The staff of the School consists of its Principal and four assistant teachers, all of whom are blind or partially sighted, four visiting lectures (three medical and one lay) and the Secretary. The Principal of the School, himself blind, headed a list of about 300 seeing candidates when he took the examinations of the Chartered Society and so sets a wonderful example for his blind students.

After the blind student has successfully passed his examinations the National Institute in co-operation with local authorities takes steps to help him open an office, usually in his own home. Letters are written to the doctors in the locality asking them to give their support. Building a practice is a hard slow business and so the National Institute stands back of the newly established blind masseur for two years. From its founding in 1915 the Massage School has trained 264 masseurs and masseuses. Of this number 113 were trained by arrangement with St. Dunstan's Organization for Blinded Soldiers, Sailors and Airmen. The large majority have been conspicuously successful.

And now has come the desire of four older students at Perkins Institute, Watertown, Mass., to go into this field. One of the physical therapists on the staff has undertaken to teach enough anatomy and massage to this group that they may know whether or not they would really be interested in this profession. It is a problem to know where they may get their training should they wish to go on. There is the possibility of sending them to England or to some seeing school here. More important still would be the problem of establishing them after training and gaining the confidence of medical men. Dependence upon others is the hardest burden imposed by blindness. Massage is a profession where they can gain independence and also feel their usefulness to others, and compete with the seeing on equal footing. Because this is such a suitable profession for the blind, and there are so few professions where they can excel, it seems that any blind man or woman apparently fitted by health, temperament, education and general ability to follow this satisfying work should be helped in every way to do so.

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Postural Values of Modern Dance

Margaret Jewell

The demand that modern dance has made upon the body as an instrument has done more than stimulate the actual teaching technique of numerous dance classes throughout the United States and Europe. It has provoked certain "posture conscious" individuals, whose various interests may range from dancing to physical therapy, to wonder if there may not be some possibility of carry-over value in the modern dance which will improve the everyday posture of thousands of young girls and women now working in this field of expression. Dancing is no longer untrammeled expression of mood or emotion—never since the Golden Age of ballet has it been so technique conscious. The modern dancer desires such perfection in technique and binds herself to the exercise necessary to produce it—not as an end in itself—but because she knows she cannot speak through the medium of movement until she has attained complete mastery of her instrument. And she must not only master the use of her body; she must build it into the instrument she desires it to be.

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Many of her immediate goals become then those of the orthopedist who works with posture, and she herself is the first person conscious of her need. General posture work often falls short of its fullest possibilities because the individual in question fails to realize any felt need for such activity. The girl who wishes to dance is self-motivated. She knows that she must have strong, sensitive feet that will help rather than hinder her; that her body balance must be so perfected that she can stand, move, change direction or position at any time with poise and ease; that her readiness for movement must mean control and decision rather than nervous anticipation. Sagging abdominal muscles, rigid or weak backs have no place in a dancer's body. A strong, flexible spine with far more localization of movement than the average person needs or desires is one of her goals; firm, well-toned abdominal muscles another.

One of the hardest things to explain to the ordinary posture case, the necessity for freedom and control of the upper back and shoulder girdle, is never a problem in dance class. Driven by the desire to move in a more meaningful fashion, students see only too clearly the

advantages of a high chest, an erect head, and a shoulder girdle which will permit the arms to be moved smoothly, firmly, vigorously as the wish may be.

The sense of body position and movement is a prerequisite of dancing. Such a "consciousness" must be both general and specific. That is—the individual must know her general body position in relation to space and the relative positions of her various body segments. "Pelvis tilted forward or back," "knees relaxed, not hyper-extended," or "chest high, shoulders easy" are statements which convey something definite to the dancer, who is able to tell without looking at the part of the body mentioned its position. Subjective control of the body becomes the customary rather than the unusual thing.

Static posture—that bugaboo of the modern orthopedist—is eliminated when body control becomes a meaningful element of movement. The fundamental principles of gravity pull, weight bearing, and efficiency in activity are demonstrated daily and any failure in application is promptly recognized.

In spite of its postural possibilities dancing must not be advocated or considered a "cure-all" for posture ills. Nothing would so quickly defeat its aim. Rather than turning individual classes into enthusiastic but doubtfully effective dance groups, let us enrich the aim of the dance instructor. There are to be found in any beginning dance class a large number of people who would be graded "C" or "Fair" in posture. Individual classes, crowded with a variety of cases, will probably never find time for them. Through dancing these students can be made more cognizant of the bodies with which they work and the operation of physical laws governing their activity.

Certain basic characteristics of modern dance movement determine the specific techniques which follow. Relaxation with a connotation of freedom rather than collapse is one of the most important principles; controlled relaxation of the entire body or any of its parts an earmark of the technique. This results in ease and efficiency because of the ability to localize control and "rest" the part of the body that is not immediately active, as well as in a complete follow-through of movement.

At the opposite end of the arc—the use of tension makes possible suspended movement—crystallizing activity into a static moment held by equal pull of antagonistic muscle groups. Tension can better be defined as the movement equivalent of tonus rather than a synonym for tensity or nervous strain.

The constant shifting which occurs between the two poles of tension and relaxation results in vibration and elasticity. All height in modern dance is attained through a recognition and use of elasticity rather than through an attempted denial of gravity. Orthopedically speaking this demands flexible feet, ankles, knees, and hips—preventing body jar upon landing and making the rise or "take off" from the floor the easy result of progressive extension of those joints. Vibration makes possible a range of movement, unattainable if the body has to overcome inertia with each attempt. Any stretching or limbering exercises are done with vibration to prevent injury.

Swing is the dancer's understanding and use of momentum in the pendular type of activity determined by human anatomy. She is "in swing" when she is using natural forces to best advantage in movement; she is "out of swing" when she is awkwardly struggling against an antagonistic force. One may stand on any street corner and sympathetically watch the mass of people who walk "out of swing" because of faulty weight-bearing, poor tonus, hyper-rigidity, or like difficulties.

A typical day's program in beginning modern dance would probably include the following exercises: progressive relaxation of the trunk, culminating in a vigorous body swing; foot exercises and leg swings, stressing the preparation of the foot to receive the body weight and the slow transference of that weight on it, and finishing with leg swings progressing forward; upper back, shoulder girdle, and arm work in any one of a variety of forms, some stressing localization of control and some leading toward a body follow-through of the arm pattern; and possibly continuing by carrying any of these patterns into a progression which will show some of the infinite variations possible. Throughout the day the instructor is busy noting individual movement characteristics and peculiarities, helping each girl as much as she can, and devising new group activities which will aid the class in freeing themselves from some common fault or weakness. As totality of individual response is achieved (or glimpsed) each student's opportunity of expressive movement is, of course, immeasurably increased.

To carry rhythmic exercise into restricted classes is, we must understand, an entirely different matter. Experiments of one kind and another have been tried in different places with varying degrees of success. It may be, however, that some people will find a bit of percussion an interesting activity to try with groups unable to take regular activity, yet eager to play some part in the group. Excellent postural results can be derived from cross legged sitting, trunk erect, arms lifted from the shoulder—elbows akimbo, while the pupil's interest is intrigued with rhythmic patterns to be played on her drum. Heart cases who often feel very "out of things" because of numerous restrictions may become valuable members of a percussion group and be revitalized by finding something to do that is welcomed and needed by the dancers.

Again—the warning—dancing neither should nor wants to be a panacea for all postural ills, but there is a real chance that it may encourage rather than discourage good posture among its students.

Suggestions for the Treatment of Adherent Scars

Marion Beytes

From a physical therapeutic standpoint, scars may be divided into three classes:

1. Those healed to bone or tendons thereby causing a limitation of motion in joints.
2. Those adhering to bone in areas where the circulation is impaired.
3. Those disfiguring scars which often occur on arms, face, or neck.

The treatment of these scars is an art in itself and requires infinite patience. The most important and the must difficult to deal with are those which cause a limitation of motion. For example: We are often confronted with the problem of freeing flexor tendons in the forearm from an area of tough and unyielding scar tissue or perhaps we have a scar on the inferior angle of the scapula which is preventing full range of motion of the shoulder girdle. It seems almost unnecessary to say that in all cases treatment should begin with heat and massage to the whole limb or to the muscles involved in the case of the scapula, before manipulation of the scar begins. If bakers or therapeutic lamps are used, the tissues should be heated slowly to avoid a drying effect. We prefer the whirlpool bath as it seems to render the scar more pliable.

Having stimulated the venous and lympatic flow by massage of the limb, we start work on the scar with small circular frictions or alternate pushing with the tips of the fingers or thumbs, working from the free edge toward the adherent portion of the scar. Then the tendons are partially stretched and the scar is vibrated with the tips of the fingers as this exercise proceeds. We finish the treatment with the application of a plaster made of three layers of adhesive. This should be large enough to cover the scar completely and should be left on for three days. Daily treatment of the limb should go on as usual. When the plaster is removed, an improvement in the condition of the scar is immediately noted. Treatment is given as stated and another plaster may be applied or it may be left off for three days. If these cases are complicated by a nerve being caught in scar tissue, the use of adhesive is particularly applicable, as manipulation is often too painful to be borne.

The use of the plaster should be left to the good judgment of the worker. It goes without saying that it would be contraindicated in cases where the scar tissue is extremely thin and likely to break open. Tender scars must be hardened before manipulation is started. They may be treated with alcohol patted on with absorbent cotton and allowed to dry, or in clinics where electricity is used, galvanism with the positive pole active will give excellent results.

The use of lubricants preceding massage is to be avoided as it is impossible to get a firm grip on a greasy surface, but, following manipulation, oil or cocoa butter may be used as a softening agent unless the adhesive plaster is to be applied.

After several weeks treatment of these cases, the improvement in function is so marked that there can be no question as to the value of the treatment. Very often, complete range of motion is restored.

In scars of the second class, we are thinking principally of those occurring as a complication of compound fracture of the tibia and fibula. Sometimes we get these cases years after the original injury. For example: A patient giving a long history of treatment for indolent ulcers in various hospitals, stated that, if he stays in bed, the leg heals but if he tries to walk the skin breaks down into ulcers. The tibial crest has a thin covering of scar tissue and the leg presents an unhealthy appearance of moist desquamation. In cases of this type, our aim is to free the skin from the bone in the hope that subcutaneous tissue will fill in, as repair of scar tissue is dependent on an adequate blood supply. If lesions are present, we massage around them and finish the treatment with wet dressings of alcohol. When the ulcers are healed and sometimes even before that, if the surrounding skin is in good condition, we apply the adhesive plaster, cutting holes for the lesions.

Some physicians prefer the ulcers to be strapped. This technic is simple. Narrow strips of adhesive are passed across the ulcer drawing the edges of the lesion together as much as possible, always leaving space for drainage. These straps may be parallel or crossed and, obviously, the ends must be anchored on firm skin, otherwise the purpose of the treatment, the support of the tissue, is defeated. Dry sterile dressings are applied over the straps.

At the present time, a patient is being treated in our clinic for a condition of the type described. His original injury occurred 30 years ago. He has been under treatment as an outpatient for a year and is soon to be discharged with his leg in good condition. During the year, he has been much on his feet and, as he weighs over 200 pounds, we feel that his leg has had a good test and it seems unlikely that he will have any further trouble.

Disfiguring scars of the third class are usually contracted and full of fibrous ridges or they are "dimpled" and adherent to the jaw-bone, often destroying the contour of the face. Massage and the application of adhesive plaster is very effective in smoothing out the ridges and in freeing the dimpled portion from the bone. This type of scar should be very carefully stretched and lubricated with cocoa butter following manipulation.

The material used in the compilation of this article comes from experience obtained in an Army Hospital following the World War. The use of adhesive plaster in layers as a valuable aid in loosening adherent scars is, I think, not widely known. These suggestions are offered with the hope that they may be useful to members of the profession.

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Fibrositis

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Fibrositis is an inflammation of the fibrous sheath and supporting structure of muscles and nerves, the ligaments of joints, fasciae, and tendons.

Thickenings have been removed and examined microscopically by Stockman. Essentially it is the white fibrous tissue that shows change. At first there is a sero-fibrinous exudate without much cellular reaction; no organisms have been demonstrated on culture. Later, the oedema is absorbed and there is fibroblastic proliferation; the veins and arteries show much endarteritis and nerve fibrils show thickening of their sheaths. The condition goes on to the formation of a small area of dense white fibrous tissue and the surrounding vessels are thickened. Similar lesions are produced by injecting various organisms intravenously into animals, and it is more than possible that the lesions in man are produced by circulating organisms becoming arrested in capillaries where the circulation is poor. Recent investigations show that bacteriaemia (e.g., B. coli or staphylococci) may occur without definite illness.

There is no specific cause, and the various aetiological factors are as follows:

1. Focal Infection. Clinicians are well aware that acute fibrositis may follow acute tonsillitis, sinusitis, tooth abscess, colitis, prostatitis, influenza, and similar infective conditions; it is also well known that a certain proportion of cases recover permanently when a septic focus is suitably treated.

2. Trauma and strain are common antecedents of fibrositis; rupture of capillaries and muscle-fibres is followed by exudation and fibrosis. Many different forms of injury can either cause or light up quiescent fibrositis; a slight muscle strain in a person subject to fibrositis may cause an acute attack. A girl practising back-hand top-spin strokes at tennis frequently missed the ball; she developed a painful thickening in the supinator brevis muscle. The so-called "tennis elbow" has a tender spot over the origin of the extensor muscles of the wrist and fingers from the external condyle of the humerus. Many of these cases are due to fibrositis. But the same spot may become painful and tender from lifting heavy weights such as a full watering-can when gardening. Acute fibrositis can develop in the scar formed by the healing of a muscle or ligament which has been torn. This explains some of the cases of persistent pain after an injury to the back muscles or to a joint.

A fracture is occasionally the cause of fibrositis. Painful thickenings may develop round the shoulder joint, in the palmar fascia, and on a flexor tendon of a finger after a Colles' fracture. Again, certain patients develop stiff joints after a fracture, while others do not. Sometimes every joint in the limb is stiff though the fracture is through the shaft of the bone and the anatomical result is good. Full movements may not be recovered for several months and sometimes there is permanent limitation of movement, especially in the finger joints which become contracted. In many of these cases there is no sign of arthritis, and no effusion. It seems that there is probably fibrositis of the ligaments of the joints. This may be due to poor circulation in the arm in a patient with a septic focus, the poor circulation is caused by the injury and the lack of movement of the limb from the use of a splint.

3. Metabolic Changes:

(a) Exogenous. It is very probable that various products of digestion circulating in the blood may cause the inflammatory reaction, as in those cases of fibrositis following dietetic and alcoholic indiscretion.

(b) Endogenous. Local metabolic products of muscular activity—that is, lactic acid—may set up the inflammation. The elderly man, unaccustomed to riding exercise, frequently develops acute lumbago, apart from the usual stiffness of thigh and arm muscles, after the first day's ride.

Fibrositis is found mainly in the postural muscles, near their attachments to bone and tendon where the blood supply is poor, as opposed to the muscles of locomotion with a plentiful blood supply. Waste products of muscular activity accumulate in excess in parts with a poor circulation.

4. Cold and Damp. The influence of these factors is well known. It is common for a Bell's palsy or stiff neck to come on after a railway journey or sleeping under an open window, and the lesion occurs on the side exposed to the draught. Similarly, an attack of acute lumbago is often a sequel to a game of tennis in which the patient has sweated profusely and has then sat down without a sweater and felt chilly across the loins. The patient with chronic fibrositis is often a "living barometer" and knows from the variations of his pains what the weather is going to be. The vasomotor mechanism is extremely delicate and responds to slight changes of temperature and pressure. The vessels in relation to fibrositic nodules have thickened walls and are therefore less likely to respond to these changes. When the weather becomes cold and raw there is a fall of temperature and barometric pressure and the body responds by general vasoconstriction of the skin vessels. The fibrositic areas, however, become congested and tense, with consequent pressure on nerve fibrils and pain. So long as the thickenings do not involve nerves, they are symptomless.

Symptoms

The onset of fibrositis is usually very gradual. Painless thickenings develop in the muscles and fasciae and sometimes there is creaking in joints on movement. Students in our school of physical therapy frequently find these thickenings when practising massage on each other. Later there may be stiffness, aching, neuralgic pains along nerves, tingling and numbness, which only develop occasionally on waking in the morning and pass off on rising up and moving the limbs. These symptoms are probably due to a certain amount of exudation into the thickenings during the night, and disappear readily on movement. Sometimes frequent attacks of cramp are the first symptoms and abdominal cramp may be mistaken for some form of colic. Early fatigue on exertion may occur with special occupations and simulate an occupation neurosis. The fibrositis can remain at this mild

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stage, with perhaps occasional acute attacks, or it can progress until the pain and other symptoms are present day and night. Acute attacks develop without a previous history of fibrositis, and recur at long intervals without intervening symptoms. It is probable that the thickening remains, but that there is pain only when there is exudation. The development of a septic focus explains some of these acute attacks. Other causes will be a change in the weather, especially to cold and damp, unsuitable food or drink, or an injury.

SPECIAL TYPES OF FIBROSITIS

Fibrositis of Muscle. In the muscle, thickenings are felt which are indefinite in outline. During an acute attack the muscle will be contracted and rigid; the thickenings may then be difficult to feel but tender spots will be discovered on pressure. The most common sites for these thickenings are in the posterior neck muscles, round the scapulae, in the back muscles, especially near the iliac crests, and in the gluteal muscles. They are comparatively rare in the limbs and when they occur are commonly situated near the attachment of the muscle to bone. The blood supply of a muscle is improved with movement, and it may be that the better blood supply of the limb muscles prevents the local development of fibrositis. This is one reason why exercises are so important in the treatment. Full movements should be performed for each of the affected joints and muscles, and especially for the trunk, neck, shoulder girdle and hip girdle muscles.

The symptoms of fibrositis of muscle will depend on whether the condition is acute or chronic. During an acute attack the muscle is contracted and rigid, and there is severe local pain and tenderness. With chronic fibrositis there is a dull ache. Pressure on the thickening commonly causes local pain, but occasionally the pain may be referred down a nerve which is not in the neighborhood of this thickening. Pressure on thickenings in the erector spinae may cause pain along different nerves according to the level at which the thickening lies. In the dorsal region, the pain is sometimes referred along an intercostal nerve, in the upper lumbar region along the external cutaneous nerve of the thigh, and in the lower lumbar region along the middle or internal cutaneous nerve of the thigh. Again, in the gluteal region, pressure on a thickening one or two inches below the iliac crest can refer pain down the great or small sciatic nerve, in the scapular region down a brachial nerve, and in the upper part of trapezius muscle along the great occipital nerve.

The thickenings are commonly found in muscles which are supplied by the same segment of the spinal cord as that in which the neuralgia occurs. Sometimes these thickenings are responsible for the referred pain, though pressure does not produce it. This is of great practical importance. A patient may complain of pain down a nerve, but on examination it is found that the nerve is not unduly tender at any spot and there is no arthritis in neighboring joints. However a thickening is found in some muscle supplied by the same segment of the spinal cord, and possibly pressure on the thickening causes the pain. The treatment should be directed to this thickening.

A patient complained of pain down the arm and tingling of the fingers. Xrays showed the presence of cervical ribs. There was no wasting of the intrinsic hand muscles, and on examination a thickening was found below the spine of the scapula. Pressure on this thickening produced the pain.

Fibrositis of Nerve. This is a perineuritis. Exudation into the nerve sheath is followed later, in chronic cases, by fibrous thickening. The onset is occasionally acute, but sometimes the thickening of the nerve trunk develops gradually with only occasional symptoms. When the nerve is superficial this thickening is often obvious. There is pain down the nerve with tingling and numbness over its sensory distribution. It is distinguished from the referred pain mentioned under fibrositis of muscle by the presence of tender spots on the trunk of the nerve and by resistance to movements which stretch the nerve. Sciatica is a good example. In cases due to fibrositis of the sciatic nerve there is tenderness on pressure at certain points over the nerve, and there is resistance to stretching the nerve. On the other hand, if the pain is due to muscle thickenings there will be tender spots in the gluteal region, usually one or two inches below the iliac crest. Pressure on one of these thickenings may cause the pain down the sciatic nerve. The nerve itself is not tender on pressure and can be stretched to the normal extent. Sometimes, however, thickenings in the gluteal region and fibrositis of the sciatic nerve occur together.

The nerve fibres are commonly not affected but paralysis of muscles and loss of sensation over the cutaneous distribution may develop from pressure on the nerve. Facial paralysis is a common example. The nerve trunk swells and is compressed in its course through the stylomastoid foramen. Occasionally slight pressure on a nerve may cause a temporary paralysis with loss of sensation. This may occur on waking in the morning or after resting in a chair. Resting the arms on the sides of a chair may lead to ulnar nerve paralysis. Usually this paralysis quickly disappears on moving the limb; also, as with symptoms of fibrositis, the nerve is only hypersensitive to pressure on certain days or with a change of weather. Occasionally the paralysis persists. The following cases are examples.

Foot-drop in one patient while kneeling to clean a grate, and in another while squatting when working in a garden. Wrist-drop was caused by lying with the hands behind the head for fifteen minutes on a bale of paper. This last patient gave a history of numbness of the little finger at times, but not of complete ulnar nerve paralysis. Recovery time varied between two and four months. There was no previous history of acute neuritis in any of these cases, but tender spots could be found along the course of the nerve.

This paralysis occurs from pressure at points where the nerve is comparatively superficial and is lying over bone. When the arm is rested on the side of a chair the ulnar nerve is pressed against the humerus just above the bend of the elbow. The musculospiral nerve can be compressed in the musculospiral groove on the back of the humerus when lying with the hands behind the head. The external popliteal nerve is compressed between the fibula and biceps femoris tendon when kneeling. If at the time there was an effusion into the sheath of the nerve, pressure paralysis would be likely to occur, since the nerve would be swollen and more liable to compression.

Fibrositis of a Joint. The thickenings occur in the ligaments and, when the joint is superficial, can often be felt as small hard and tender nodules. In the acute stage the joint may be stiff and painful. But in the mild chronic stage there is often only a dull ache, which may be associated with creaking on movement. It is distinguished from arthritis by the absence of bony changes and synovial thickening. Also, since the inflammation only affects the ligaments, there is seldom much effusion into the joint.

Fibrositis of Fascia. This may affect the superficial or deep fascia. Fibrositis of the superficial fascia is call panniculitis. There may be a subcutaneous thickening or a brawny mass adherent to the skin. It is often very difficult to decide whether the subcutaneous tissue is normal, since it varies very much in different individuals according to whether they are stout or thin. With panniculitis there will be aching pain and the thickening will be tender on pressure or gentle pinching. Fibrositis may occur in the deep fascia in the form of localized tender nodules. Sometimes there are no obvious thickenings, but there is creaking on applying friction massage to the part. This is especially common with the deep fascia over the back muscles.

Fibrositis of Tendons. This is relatively uncommon. As a rule the onset is acute, with severe pain and redness of the skin. The extensor tendons just above the wrist are most frequently affected and fine crepitus may be felt for three or four inches above the joint. The acute stage usually lasts from three to seven days, but the crepitus may persist for a month or more. In our experience it is uncommon to get adhesions, and complete resolution is the rule. Thickening of a tendon may come on insidiously, and crepitus, recognized by the patient, may be the first sign. Sometimes a well defined nodule appears: one of these on the long flexor tendon of the hand is the cause of "snap-finger." The thickenings are tender on deep pressure and there may be pain on any movement which involves the use of the tendon.

Diagnosis

Mistakes are usually due to insufficient examination. It is essential that the patient be properly stripped and lie down in such a way that the affected muscles are lax. A dusting powder should be applied to allow the examiner's fingers to slip easily over the skin. It often takes five minutes of careful kneading to localize the tender nodules and, unless these are accurately localized, treatment cannot be efficient. The average practitioner would never pronounce the lungs normal without an examination of at least three minutes, and yet few will spend the same time in examining for fibrositis.

The second point to remember is that chronic lumbago and sciatica are unusual in young subjects, and the practitioner should be on the look-out for a tuberculous lesion of bone and have an xray taken if the pain lasts for several weeks.

Treatment of Acute Fibrositis

General. In all but the mildest types the patient should be put to bed. Continual application of mild dry heat is beneficial and can be supplied best by means of a sixteen candle-power carbon bulb in a hand lamp strapped to the inside of a bed-cradle. This keeps up a constant dry heat and can be regulated by the patient himself, as he can turn it off and on as required. At the onset a good hot bath, or better still a Turkish bath, will ease the pain, cause the skin to act, and generally make the patient more comfortable. The bowels should be well opened. The diet should consist of hot fluids only for the first forty-eight hours, with plenty of fruit juice and sugar. This ensures excretion by the skin and kidneys of toxins and metabolic products.

Drugs. A Dover's powder at night gives a good night's rest. Aspirin in big doses, grs. 15 6-hourly, relieves pain and is often almost a specific.

Local. Of all forms of physical therapy, heat is the most valuable in the acute stage. It may be given as moist heat, by the old-fashioned linseed and mustard poultice, or in a neater and more cleanly manner by antiphlogistine. The applications must be kept really hot.

Heat. Dry heat may be supplied by (1) a single carbon bulb of about thirty-two candle-power in a hand lamp; (2) a small radiant heat bath; (3) a small electric radiator—the "Bowl-fire type" is especially useful; or (4) a flat electrically heated pad. When available, diathermy is especially valuable, since it differs from the above methods in that the deeper tissues are directly heated.

Massage. Gentle effleurage, which consists in stroking the skin with the hand in the direction of the nearest lymphatic glands, should be employed from the beginning, since it tends to reduce the exudation and so relieve the pain. Friction massage should be added as soon as the local tenderness is sufficiently diminished; the skin moving with the hand or finger is rubbed against the deeper tissues. This form of massage is applied to each thickening in turn and, unless the part is very tender, with heavy pressure.

Movements. With fibrositis of muscle, very gentle active movements through a small range should be attempted even during the acute stage; these are gradually increased in range with the object of relaxing the muscle spasm. A hand pressed over the muscle, but not over the tender area, will often ease the pain on movement.

Counter-irritants. The heat can be followed by local application of ultraviolet rays to cause a second or third degree erythema, or by the constant current; the effect of both is probably simply counter-irritation. They are preferable to other counter-irritants such as mustard, iodine, and vesicants, as they do not cause injury to the skin, which might prevent further massage.

Dry-cupping. This old-fashioned treatment is easily applied anywhere and deserves further recognition, as it frequently relieves pain in a remarkable way.

Acupuncture. If these other methods fail to relieve the pain in three or four days acupuncture should be given a trial. For this the skin is purified and a fairly wide area of skin and subcutaneous tissues infiltrated with one per cent novocain by means of a fine hypodermic needle. Then a large needle from a 20 c. cm. syringe is passed through the skin and thrust slowly through the affected muscles in several different directions. As a rule a single skin puncture suffices to needle a fairly wide area of muscle.

Treatment of Chronic Fibrositis

Septic Foci. A thorough and careful search should be made for foci of sepsis. If the usual physical examination reveals nothing, radiograms should be taken of the teeth and nasal sinuses and a culture of the urine should be made in all doubtful cases. Any vaginal or aural discharge should be investigated and, if these prove negative, the stools should be examined bacteriologically. In cases in which nothing is found a course of Plombière's treatment is well worth a trial. The bowels should be opened twice a day. It is advisable to keep the patient on a diet that is mainly vegetarian for a week or two at least. Plenty of fluids should be taken and a four mile walk a day is an excellent rule. In adipose persons attempts should be made to reduce weight to the average figure.

Drugs. There is no specific drug, and medicines do not play a large part in treatment. Iodine in some form is undoubtedly valuable, especially Lugol's iodine solution; M v. twice daily is an average dose. A course of thyroid extract is useful and probably promotes a better

metabolism of the skin tissues. It should be given in moderate doses—namely, grs. five daily.

With the idea of increasing general immunity, collosol manganese can be given intramuscularly and extra vitamins may be given in the form of radiostoleum. Intestinal antiseptics such as dimol or guaiacol are worth a trial in suitable cases.

Massage. The application of heat is continued to ease the pain, but massage, consisting of effleurage and frictions, is the essential treatment. Each thickening must be treated in turn with a few minutes' massage and this must be persevered with daily. The majority of thickenings will disappear with this treatment, the more recent ones requiring a shorter course. The patient should be warned that massage is likely to increase the pain for the first few days.

Movements. The muscles and joints are worked through their full range of movement, special attention being paid to the stretching of structures such as muscles, ligaments, or nerves, which are likely to become shortened by the contraction of the newly formed fibrous tissue. In the later stages of the course of treatment, exercises and faradic current are employed to develop the wasted muscles.

When fibrositis is associated with obesity it is very important to reduce the weight with special diet and exercises. General faradism to the muscles, applied by the Bergonié method, is often very effective; it should be employed in those cases in which it is difficult to persuade the patient to perform the exercises with sufficient vigor and regularity.

Counter-irritants. These may be used in cases of fibrositis in which the pain persists in spite of treatment; they are also of value in cases of perineuritis which are not amenable to treatment by massage.

Some special points in the treatment of perineuritis. Heat is applied in the acute stage, either by means of radiant heat baths or by diathermy. The diathermy current can be used in two ways. It can be passed along the limb in strength only sufficient to cause mild heating (since a greater degree frequently increases the pain); or it may be given locally to the nerve at the tender points. In cases of facial paralysis the diathermy current or the constant galvanic current is applied to the region of the stylo-mastoid foramen to improve the circulation and reduce the swelling of the nerve. In the subacute and chronic stages of perineuritis, effleurage and frictions are used along the course of the nerve. The frictions are given with considerable pressure to deep nerves such as the sciatic, but with less pressure to superficial nerves, especially at points where they lie over bone.

With certain nerves, the massage is followed by nerve stretching. At first this is performed gently, but with increased force as the pain diminishes. Massage, exercises, and the faradic current are utilized to develop the wasted muscles.

With pressure paralysis special splints should be worn for wrist or foot-drop. Commonly the faradic reaction is only slightly reduced, so that this current can be used for muscle stimulation. But for facial paralysis the galvanic current is more comfortable because the muscles are usually hyperexcitable to this current and painless contractions can be obtained with about 1 ma., while the faradic current is very painful on the face. As soon as any active movement returns to the paralyzed muscles it is carefully re-educated with graduated exercises.

Surgical. Localized chronic painful nodules which do not improve with medical treatment in a few weeks should be excised under a local anaesthetic. The definite tender thickenings which can be felt in the nerve in sciatica should be incised under general anaesthesia and the nerve should then be forcibly stretched. Distension of the sciatic sheath by means of injection of 100 c.cm. of normal saline or one per cent quinine urea-hydrochloride has met with a few excellent results in our hands, but on the whole has been disappointing.

The rather more diffuse thickenings that occur in the lumber and scapular regions may be infiltrated with an oily solution known as A.B.A. (Allen and Hanburys). This is slowly absorbed and produces analgesia for one to three weeks. During this time rather more drastic massage may be given, with complete cure in some cases. This solution usually causes a burning sensation for a few minutes.

In conclusion, we would point out that we do not claim that any of this treatment is original; our object in writing this article was to set out the forms of treatment that we have found most useful and to emphasize the importance of accurate diagnosis.

Effect of Environmental Temperature on Blood Pressure

Abstract in Jour. A. M. A., 105:20:1637, Nov. 16, 1935, from Am. J. Physiol., 113-181, Sept. 1, 1935.

In a study of the effect of an increase in the environmental temperature on the systolic and diastolic blood pressures and pulse rates of sixteen normal men, Gottlieb found that:

1. When the room temperature was maintained between 23.1 and 23.9 C. (73.6 and 75 F) for an observation period of three and one-half hours, the mean pulse rate decreased significantly —9.9 beats per minute, the mean systolic blood pressure showed no change and the mean diastolic blood pressure increased significantly —8.7 mm. of mercury.

2. When the room temperature was increased from 23.6 to 33.2 C (74.5 to 91.7 F) during the period of three and one-half hours, the mean pulse rate increased 2.6 beats per minute during the first hour, then decreased significantly —5.8 beats per minute, the mean systolic blood pressure showed no change and the mean diastolic blood pressure increased significantly —3 mm. of mercury.

3. A study of the differences of the two experimental days indicated that as a result of an increase of 9.6 degrees C. (17.2 F.) in the air temperature the mean pulse rate increased significantly, the mean systolic blood pressure showed no change and the mean diastolic blood pressure decreased significantly.

Treatment of Peripheral Vascular Disease by Means of Suction and Pressure

E. M. Landis, F. A. C. P., and L. H. Hitzrot

At the meeting of the College in 1934, one of us presented certain observations[1] indicating that blood flow to the extremities could be increased at least temporarily by applying alternate negative and positive pressure. In patients with peripheral vascular disease and advanced organic arterial occlusion this procedure elevated skin temperature conspicuously, often relieved cyanosis, usually diminished rest pain and favored the healing of indolent ulcers. While symptoms were quite generally relieved it was then felt impossible to do more than speculate upon the permanence of that improvement. To quote the statement then made, "The practical importance of suction and pressure in the treatment of peripheral vascular disease will necessarily depend to a great extent on the degree to which collateral vessels take over the function of those arteries which are closed by disease. Sufficient time has not elapsed to justify any conclusions concerning the real clinical usefulness of the procedure."

It is the purpose of the present report to present a summary of our experience in the first seventy-five cases subjected to suction and pressure therapy (table I). An attempt will be made to give a fair cross-section of general results in hospital cases and out-patients, including, without omission, all cases so far treated even briefly by this method.

TABLE I

Summary of 75 Consecutive Cases Treated by Means of Suction and Pressure

Diagnosis	No.	Age—Years Avge.	High	Low	Suction and Pressure Therapy—Hours Avge.	High	Low
Arteriosclerosis, senile	23	69	80	52	22	91	2
Thromboangiitis obliterans	22	41	61	26	31	119	5
Diabetes, arteriosclerosis	30	62	78	42	26	90	2
Total	75						

Note: Treatment for two to five hours represents merely attempted palliation in patients in whom conservative therapy was essentially hopeless.

Read at the Philadelphia meeting of the American College of Physicians, May 3, 1935.

From the Robinette Foundation, University of Pennsylvania Hospital, and the Metabolic Division of the Philadelphia General Hospital.

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The apparatus used was the same as that described previously.[2, 3] During treatment the patients sat or reclined in bed. The affected extremity was inserted into an aluminium chamber and lay in the horizontal plane upon a pillow in the bottom of the chamber. The thigh, protected when necessary by a layer of gauze bandage, was encircled at a point approximately six inches above the knee by a rubber cuff with two leaves, one sealing during pressure, the other sealing during suction. A layer of adhesive tape was applied to each cuff to keep the rubber in close contact with the skin. Suction amounting to between 80 and 120 mm. of Hg was applied for twenty-five seconds alternately with positive pressure of 40 to 80 mm. of Hg for five seconds. The time required to change the air pressure within the aluminium chamber from—120 to + 80 mm. of Hg was reduced to about three seconds in order that the negative pressure might be applied as efficiently as possible. Until patients became familiar with the apparatus it was usually expedient to use — 80 and + 60 mm. of Hg for twenty-five and five seconds, respectively, increasing to — 120 and + 80 mm. of Hg unless large changes of pressure were contraindicated.

In general when rest pain was severe, or when ulcers had not yet begun to heal, the affected extremities were exposed to suction and pressure for one or two hours twice daily. After rest pain had diminished somewhat and after ulcers had begun to heal, the duration of treatment was reduced to one or two hours at first once daily, then three times weekly and finally to one or two hours once weekly. Out-patients with relatively mild symptoms were treated for periods of one or two hours three times weekly or less.

Ulcers were dressed daily with vaseline gauze; antiseptics were used only rarely, since even the mildest seemed to delay the growth of granulation tissue and epithelium in ischemic extremities. Parts involved in dry gangrene were merely covered with sterile gauze.

A few of the patients had previously received citrate solution or typhoid vaccine intravenously without relief. Most of the ward patients had been treated by other conservative means, including particularly the thermo-regulated cradle and vasodilator drugs, before suction and pressure were resorted to on account of persisting symptoms. In these cases the thermo-regulated cradle was used during the intervals between suction and pressure treatments. Out-patients received the usual advice concerning care of the extremities and smoking. They were advised to use hot sitz baths and in selected instances salt solution by mouth was prescribed.

The extent of organic occlusion and the development of collateral circulation were tested at intervals by measuring skin temperature while the forearms were heated, either by means of warm water or electric pads.

The seventy-five cases considered in this report include twenty-three with arteriosclerosis, twenty-two with thromboangiitis obliterans and thirty with diabetes and arteriosclerosis. The average age of the arteriosclerotic group was sixty-nine years, ranging from eighty to fifty-two. The ages of the diabetic patients averaged sixty-two years, while the patients with thromboangiitis obliterans were approximately twenty years younger, averaging forty-one years.

Owing to limited facilities it was possible only to assist in recovery from the more advanced manifestations of ischemia,—severe rest pain, indolent ulceration or marked intermittent claudication. No attempt could be made to continue suction and pressure therapy as a prophylactic measure in order to avoid recurrences or to avert future difficulties. The average amount of treatment ranged from twenty-two to thirty-one hours with several instances of ninety hours or more. Treatment

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totalling only a few hours (such as two or five hours) represents attempted palliation in patients in whom any conservative therapy was essentially hopeless from the outset. It was our purpose, however, to observe the effects of suction and pressure on peripheral vascular disease of all grades of severity, including even the most hopeless cases.

The general results are shown in table II in which the effects have been tabulated under the headings good, fair and poor. A good result includes obliteration of rest

TABLE II

General Results of Suction and Pressure Therapy

Result	Number of Cases	Per Cent	
Good	38	51	61
Fair	10	13	
Poor	27	36	
Total	75		

Analysis of Cases Designated "Poor."

Too far advanced. Massive gangrene or sloughs	6		
Infection	4	*Amputations*	10
Drifted away	5		
Incomplete	12		
Total	27		

pain, distinct lessening of claudication and the complete healing of ulcers previously increasing or indolent under other conservative measures. Such outstanding relief, which could in all fairness be attributed to suction and pressure therapy, was observed in fifty-one per cent of the seventy-five cases. A fair result includes almost, but not quite, complete relief of rest pain, slight but definite lessening of claudication, and healing of lesions except for very small sinuses or minute areas. There was no evidence of advance in symptoms or signs, the tendency being toward very slow improvement in this group which comprises thirteen per cent of the total.

The designation "poor" has been used to indicate that the relief of symptoms ordinarily observed *immediately during* suction and pressure therapy has not been accompanied by significant relief of symptoms *between* treatments. It is possible that prolonged and frequent therapy might accomplish more than the limited amount we have been able to use in these cases. This group includes six patients who had massive gangrene or deep sloughs, in the face of which suction and pressure therapy was useless except as a temporary palliative measure. Four patients had, or developed, advancing infection. These ten cases required amputation eventually. Five cases listed as poor results drifted away, three of these in spite of definite improvement, two because of dissatisfaction with the results obtained. The remaining twelve patients are still under treatment which is incomplete and has not progressed far enough to permit estimation of eventual results. Six of these twelve patients, however, are showing encouraging progress at the present time.

It may be concluded that "good" and "fair" results were obtained in sixty-four per cent, any error being, we believe, in the direction of too low a figure. Similarly the estimate of poor results in thirty-six per cent is probably too high since it includes certain cases which we would now regard as hopeless from the outset, and a certain number in which therapy has not had a fair trial.

When the results of suction and pressure therapy are arranged according to diagnosis (table III) it becomes evident that the poorest results have been obtained

TABLE III

Results of Suction and Pressure Therapy According to Diagnosis

Diagnosis	Result: Good	Fair	Poor	Total
Arteriosclerosis	12	3	8	23
	52%	13%	35%	
Thromboangiitis obliterans	14	1	7	22
	64%	5%	31%	
Diabetes	12	6	12	30
	40%	20%	40%	

in diabetes, with slightly better results in simple arteriosclerosis. The highest percentage of good results was obtained in thromboangiitis obliterans. This distribution agrees in general with observations on other types of conservative therapy.

Landis and Hitzrot[4] published, in March 1935, a summary of the results observed in thirty cases treated up to July 1934 (table IV). A "good or fair" result was obtained in twenty-four cases. Most of these patients were hospitalized and had been treated conservatively by the usual methods without success prior to the use of suction and pressure therapy. The apparent benefit derived in these twenty-four patients seemed therefore more significant than it would have been if unselected cases had been treated. It has been possible to obtain follow-up data on twenty-three of these twenty-four cases. Thirteen had no further symptoms of peripheral vascular disease during six to twenty-two months after discharge,

TABLE IV

Persistence of Improvement Once Obtained

Of 30 severe cases (Landis and Hitzrot,[4] treated prior to July 1934 and reported March 1935)

6 Poor

24 Good and fair

Of the 24

13—No further symptoms in 6 to 22 mos. (average 11 mos.)

1—Mild recurrence, yielding to treatment

6—Died, ages 78, 62, 57, 55, 75, 46

1—Cerebral hemorrhage

3—Pneumonia

2—Coronary occlusion

3—Relapses

2—Amputation of leg

1—Amputation of toe

1—Lost

Total 24

the average period being eleven months. One case presented a mild recurrence yielding easily to suction and pressure therapy. Six patients died, one of cerebral hemorrhage, three of pneumonia, and two of coronary occlusion. The causes of death alone indicate the precarious general condition of most patients with advanced peripheral vascular disease. Definite relapses were observed in three instances after suction and pressure therapy had healed indolent and painful lesions. In the first patient a necrotic lesion of the great toe appeared six months after discharge and advanced slowly in spite of suction and pressure therapy. Amputation of the leg above the knee revealed marked sclerosis of the femoral artery. A second case appeared four months after discharge with gangrene of a toe in which ascending infection contraindicated the use of suction and pressure, leading finally to amputation above the knee. The third case suffered from subacute thromboangiitis obliterans which had already required amputation of three digits in the course of two years. Suction and pressure had been required to heal the ulcer remaining after the last amputation. One year later the patient reappeared with a deep ulcer at the base of another digit. Involvement

of an interphalangeal joint and osteomyelitis of a phalanx contraindicated suction and pressure therapy. The fifth toe was amputated in January 1935, local heat, vasodilator drugs and suction and pressure being used to aid healing of the wound. Whether or not continued treatment of these three patients after discharge from the hospital would have modified the final result is not known. These relapses suggest, however, the need for continuous after-treatment even though ulcers have healed and rest pain has disappeared.

A number of other patients not shown in this table have been followed over briefer periods of time after suction and pressure therapy has been stopped. If these are included, the follow-up data indicate continued relief in at least twenty-six patients of the group from one month to two years after discontinuance of suction and pressure therapy.

An analysis of possible causes of relapse in six of the forty-eight cases discharged with good or fair result is of considerable interest (table V). Discharge from the hospital with an imperfectly drained lesion was followed by a relapse with increased rest pain and increased ulceration at the end of two months. This ulcer was healed with difficulty by renewed treatment. In acute or subacute thromboangiitis, recurrence or relapses can be expected since the disease ordinarily advances at a rate too rapid to allow the compensatory development of collateral blood flow. One patient returned in a year with gangrene of a toe requiring amputation. Another with severe rest pain returned after six weeks with renewed rest pain, the first period of treatment having been quite definitely insufficient.

TABLE V

Causes of Relapse—6 Cases in 48 with Fair or Good Result	
A. Discharged with imperfectly drained lesion	1
2 mos.—healed with renewed treatment.	
B. Advancing subacute thromboangiitis obliterans	2
(*a*) 1 year—gangrene of toe, amputation of toe.	
(*b*) 6 weeks—return of rest pain.	
C. Widespread advanced arteriosclerosis	3
(*a*) 6 mos.—ulcer healed with renewed treatment.	
(*b*) 4 mos.—gangrene toe, mid-thigh amputation, sclerosed femoral artery.	
(*c*) 6 mos.—gangrene toe and infection, mid-thigh amputation.	

Widespread advanced arteriosclerosis involving the femoral artery seemed be responsible for at least three recurrences at four to six months after cessation of treatment. In one patient renewed treatment was successful in healing the lesion. In two patients previously mentioned, mid-thigh amputation was necessary, one on account of advancing gangrene and the other on account of acute infection.

As might be expected from the advanced age of at least two-thirds of these patients, the death rate in a group followed over two and a half years is relatively high (table VI). Eleven of the seventy-five cases treated with suction and pressure therapy have died, three of coronary occlusion, one of cerebral hemorrhage, four after amputation and three from pneumonia. The lower portion of the table presents possible injurious effects of suction and pressure therapy. In two of these cases amputation was inevitable before suction and pressure were applied, the procedure being tried only to exhaust the use of all possible conservative measures. In the third case amputation was hastened owing to the development of ascending infection. In this instance amputation was being seriously considered as the only alternative before suction and pressure therapy was started as a last resort. We have observed no instances of massive thrombosis or embolism. A few cases have become progressively worse during suction and pressure therapy, owing to the presence of massive gangrene or deeply penetrating sloughs. Though the area of gangrene slowly increased in size there was no massive increase in ischemia, and there were no symptoms or signs that could be ascribed to a large thrombus or embolus. Petechiae appeared in two diabetics with delicate skin without sequelae in either instance. Improper adjustment of the cuff above the thigh makes hemorrhages more likely to appear since constriction prevents complete evacuation of blood during the period of pressure. This complication can be avoided by adjusting the cuff carefully and by observing the emptying of the vessels during pressure.

TABLE VI

Deaths—11 of 75 Cases	
1. Coronary occlusion	3
2. Cerebral hemorrhage after prostatic punch operation	1
3. Post-amputation	4
4. Pneumonia	3
Possible Injurious Effects of Suction and Pressure Therapy	
1. Amputation hurried	3
In 2 amputation inevitable before suction-pressure therapy.	
In 1 amputation being seriously considered.	
In all 3 suction-pressure therapy used to exhaust all possible conservative measures.	
2. Thrombosis or embolus	none
3. Petechiae	2
Both diabetics, no sequelae.	

TABLE VII

Factors Predisposing to Failure or Very Slow Improvement in 12 Cases: ("Poor Result")	
Extreme arterial occlusion	8
Massive gangrene or slough	8
Badly infected lesions	5
Osteomyelitis	3
Severe dermatophytosis	2

It is essential to know what conditions are most apt to lead to failure of conservative therapy including suction and pressure (table VII). In twelve cases classified under "poor results" suction and pressure therapy, after fair trial, failed to arrest the effects of ischemia. Extreme arterial occlusion involving the large vessels was present in eight cases. Deeply extending gangrene or massive sloughs were present in eight cases. In these patients the immediate problem is primarily mechanical since devitalized tissue must be removed before healing can take place. Infection and pain are both apt to increase as long as necrotic tissue remains. Judicious surgery plus suction and pressure therapy should yield better results than either procedure alone.

Infection appeared to be extending in five cases. Acute ulcers are more dangerous to treat by suction and pressure than are chronic ulcers which are well walled off by inflammatory tissue. While patients with open lesions are being treated it is essential to investigate the extremity before each treatment in order to be certain that there is no phlebitis and that infection is not spreading. Patients with even slight elevation of temperature should be treated only with the utmost caution. If the presence of encapsulated pus is suspected suction and pressure therapy should not be used. When such lesions are present external drainage must be complete and continuous. It is this possibility of harm from spreading infection that makes suction and pressure therapy distinctly not a routine procedure. On the contrary, it can be decidedly dangerous under some circumstances. Patients who are undergoing suction and pressure therapy must be followed carefuly by a physician,—they cannot be left to the attention of technicians alone.

Osteomyelitis was present in three cases. As might be expected cutaneous lesions healed satisfactorily, but as long as drainage from the infected bone continued sinuses remained. These sinuses could not be closed by suction and pressure therapy. Osteomyelitis was responsible for one amputation after a cutaneous lesion had disappeared; and was responsible for two "fair" results in which sinuses remained after the cutaneous lesions and the symptoms had largely disappeared. Severe dermatophytosis in conjuction with advanced organic occlusion was, we believe, responsible for two failures. It is our impression that the application of potassium permanganate even in weak solution may affect the ischemic skin deleteriously. Dermatophytosis in conjunction with very mild organic occlusion is of little consequence, but when combined with severe organic occlusion it becomes a major complication.

Fourteen cases have been studied with respect to the change in skin temperature of the lower extremities when the forearms were heated either by immersion in warm water[5] or by electric pads. In seven (table VIII) of these fourteen cases a "good" or "fair" therapeutic result has been accompanied by definite objective evidence of improvement in collateral blood flow as measured by increase in vasodilator response. Over a period of nineteen to twenty-two months the vasodilator response may improve remarkably, indicating that it is well worth while to temporize in crises of pain or claudication in order that time may be gained for the development of adequate collateral circulation. As this table shows, improvement in circulation may be very conspicuous by objective test.

TABLE VIII

Increase in Vasodilator Response Following Suction and Pressure Therapy

Patient	Diagnosis	Treatment Hours	Vasodilator Response Before °C.	Vasodilator Response After °C.	Time Elapsed	Therapeutic Result
1. Po.	T. A. O.	71	None	29.2	22 mos.	Good
2. He.	T. A. O.	24	None	30.2	19 mos.	Good
3. Ro.	T. A. O.	112	27.6	30.6	22 mos.	Fair (claud.)
4. Ca.	T. A. O.	20	28.0	29.5	6 mos.	Fair (osteo.)
5. Ha.	Arterioscl.	91	None	26.3	11 mos.	Good (sl.pain)
6. Li.	Diabetes	70	None	29.5	6 mos.	Good
7. Fi.	Arterioscl.	16	None	27.4	2 mos.	Good

An equally large number of patients (table IX), however, showed no measurable change in their vasodilator response after periods of two months to one year. These patients have, however, been followed over briefer periods of time and objective signs of collateral circulation may eventually develop. The relief of symptoms in this group was, in general, not as good as in the other group which showed conspicuous increase in vasodilator response. One patient returned after six months with a relapse requiring amputation. Conservative therapy was justified, however, because of the symptomatic relief afforded each patient at least temporarily.

TABLE IX

No change in Vasodilator Response Following Suction and Pressure Therapy

Patient	Diagnosis	Treatment Hours	Vasodilator Response Before °C.	Vasodilator Response After °C.	Time Elapsed	Therapeutic Result
8. Sa.	Arterioscl.	14	23.4	24.4	3 mos.	Moderate relief claud.
9. Ba.	Arterioscl.	20	26.8	23.4	2 mos.	Rest pain abolished. Claud. delayed
10. Fi.	Arterioscl.	14	29.5	29.5	2 mos.	Rest pain mod. rel'v'd. Claud. unchanged
11. Ec.	Arterioscl.	17	None	None	2 mos.	Ulcer healed, rest pain relieved.
12. Ra.	T. A. O.	22	None	None	2 mos.	Rest pain diminished 75%
13. Dr.	T. A. O.	60	None	None	1 yr.	Rest pain partly relieved, ulcer healed
14. Tr.	Diabetes	44	None	None	6 mos.	Relapse, gangrene, amputation

In summary, suction and pressure therapy has been used in the treatment of seventy-five patients with peripheral vascular disease. Negative pressures between — 80 and — 120 mm. Hg and positive pressures between + 40 and + 80 mm. Hg were applied alternately for twenty-five and five seconds, respectively, beginning usually with the lower pressures. Patients were treated for one to two hours at first once or twice daily, then three times weekly and finally, as the symptoms and signs diminished, once weekly.

Cyanosis was usually diminished; symptomatic improvement was sometimes observed, however, without significant change in skin color. The rest pain of ischemia was usually abolished during actual use of suction and pressure and gradually became less severe in the intervals between exposure to pressure variations. Ulcers enlarging or indolent under ordinary conservative treatment usually began to heal soon after suction and pressure therapy was instituted. Intermittent claudication became in general milder and exercise tolerance was slightly, but definitely, increased.

Suction and pressure therapy was of no definite lasting service in patients with osteomyelitis, deeply extending gangrene or large sloughs. A certain number of patients with severe, widely disseminated arteriosclerosis did not improve.

This form of therapy is *contraindicated* in patients with phelibitis, encapsulated pus or acute spreading infection. Patients must be followed day by day so that any change in the clinical picture may be detected. It is only in this way that the possible injurious effects of suction and pressure can be avoided. The therapy should be applied with caution in appropriate cases, under the direct supervision of a physician.

Suction and pressure therapy appears to be a worth while addition to the other conservative methods of treating peripheral vascular disease. Good results can be obtained even when organic obstruction has advanced to the stage in which arterial blood flow can no longer be increased by measures depending on vasodilatation. Symptoms and signs of ischemia have been relieved when other conservative measures proved ineffectual. The method may be of particular service in increasing local blood flow temporarily during episodes of pain or ulceration, so that time is gained for the development of adequate collateral circulation. This development of collateral circulation is slow, but over periods of six to twenty-two months has been observed to be capable of increasing the vasodilator response in the lower extremities with persisting symptomatic improvement.

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Routine in Inexpensive Physical Therapeutic Measures in the Treatment of Chronic Arthritis

Chas. LeRoy Steinberg, B. S., M. D.

This is the age of the machine. Or we might state that modern society has succumbed to the machine and its usual driving force, electrical power. Not only has this become true in ordinary industrial life, but it has also become a part of the armamentarium of the physician. The physicist has discovered newer and more expensive methods of creating heat. Our early ancestors were content with such elemental sources of heat as the sun rays and fire created by means of flint. The chemist arrived on the scene much later and led the way to chemical methods productive of heat. It is this method which is used in acetylene welding today—a process requiring high degrees of temperature. In recent years electricity has become widely used in the production of heat. The medical fraternity has learned to use various instruments employing the principle of high frequency electrical waves in the production of fever. A new term, electropyrexia (fever therapy induced by electrical methods), has been evolved. This latter method has received extensive experimentation in regard to its value in the treatment of chronic arthritis. The sum substance of this work has led to the general belief that higher fever therapy is of questionable value in all cases of chronic arthritis with the notable exception of gonorrheal arthritis. The author concurs in this opinion.

He has found that moist heat produced by relatively inexpensive methods and by appartus which is present in the every day home is of distinct value in the treatment of chronic arthritis. The moist heat may be given in the form of local or general treatment. In the former method hot moist packs with or without agents which utilize the principle of osmosis are employed. Local heat is used in those cases in which the general physical condition of the patient prohibits the general method. In the general method hot baths are employed. The initial temperature of these baths is usually 40° centigrade. This is gradually increased until 43.5° centigrade is reached in the sixth or seventh week of treatment. The patient is allowed in these baths from ten to fifteen minutes. During these periods prescribed exercises are executed. It must be borne in mind that even such simple treatment may be hazardous and no one should prescribe such treatment unless a careful physical examination has been done. This caution is particularly applicable to the cardial vascular apparatus. In those instances in which local treatment to swollen joints is indicated, the local application of infra red heat for ten minutes followed by hot moist packs for ten to fifteen minutes is markedly beneficial.

Another phase of considerable concern in the treatment of chronic arthritis is the gastrointestinal tract. Such symptoms as anorexia, periodic attacks of nausea or vomiting, epigastric pain, gas, constipation, and occasional attacks of diarrhea are not uncommon. Lane, Much, Pemberton, and Fletcher have called attention to the abnormal gastrointestinal pattern which is associated with chronic arthritis. The author has recently found (unpublished data) that not only the less serious patterns of the gastrointestinal tract such as atonicity and spasticity are associated with chronic arthritis, but that peptic ulcer and diverticulosis are not uncommonly found. The striking similarity of the symtomatology of B complex avitamosis of lesser or greater extent and that associated with chronic arthritis is striking. However, a study of the dietary habits of chronic arthritics as carried out by other students and by the writer has failed to indicate a lack of intake of the B complex. This probably means that the arthritic requirement of the B complex is greater than in the normal individual. The author has therefore fed his arthritic patients Vitamin B Complex (Parke, Davis & Company) in doses of four to twelve cc. daily. Along with this medication colonic massage has been prescribed. This has resulted in marked improvement in the gastrointestinal symptoms of these people.

In conclusion, it is important to stress the systemic nature of chronic arthritis. The procedures prescribed above are to be used along with other measures which recognize the general as well as the local nature of chronic inflammatory joints. This opinion is strongly advocated by the American Association for the Study and Control of Rheumatic Diseases. Its almost universal acceptance by every careful student has been a milestone in the progress recently made in the study of chronic arthritis, particularly the rheumatoid type.

Department of Medicine, Rochester General Hospital.

The Physiotherapy Review

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Attention!

Attention is called to the error in convention dates on the rear cover of the last issue. The dates are: June 28 to July 2.

Notice

The National Executive Committee makes still another call to all those members who have not returned their questionnaires, to return them at once. As explained before, this questionnaire is only for the purpose of compiling a membership list to take the place of the one which used to be published in the REVIEW—it is not for the purpose of checking up on members.

Convention Program

JUNE 28th to JULY 2nd

Sunday, June 28th

Registration begins at two o'clock. The fee for members and others is one dollar. The program sessions are open to those doing physical therapy, members of departments of physical education, and members of the medical profession.

5:00 P.M. Brag Supper in the Patio. Reports from chapters and members at large.

Monday, June 29th

Little Theatre, Ambassador Hotel.

9:00 A.M. Business Meeting.

10:00 A.M. *Fever Therapy,* Rodney Atsatt, M.D., The Santa Barbara Clinic.

11:00 A.M. *The Chronic Patient and Physical Therapy,* Frances Baker, M.D., Director of Physical Therapy, University of California Hospital, San Francisco.

Monday afternoon is reserved for visiting the exhibits. There will be both commercial and scientific exhibits.

7:00 P.M. At the Orthopedic Hospital.
Clinical Demonstration of Fascial Transplants, followed by a film on Transplants, Charles LeRoy Lowman, M.D., Chief of Staff, Orthopedic Hospital, Los Angeles.

8:00 P.M. *Some Observations on the Effect of the Pool on the Blood Pressure and Fatigue of the Technicians,* Robert L. Carroll, M.D., Orthopedic Hospital, Los Angeles.

8:30 P.M. Pool Demonstration, Susan G. Roen and department staff.

Tuesday, June 30th

Little Theatre, Ambassador Hotel.

9:30 A.M. *The Recent Poliomyelitis Epidemic in Los Angeles,* Robert W. Meals, M.D., Hollywood, California.

10:30 A.M. *Endocrinology and Physical Therapy,* Clifford A. Wright, M.D., Los Angeles.

11:30 A.M. *Metabolic Factors in Osteochondritis,* Lyman A. Cavanaugh, M.D., Santa Barbara.

2:00 P.M. *Symposium on Body Mechanics,* Presiding, Sven Lokrantz, M.D., Director, Health Service Section of the Los Angeles Public Schools.
The Methods and Results of the Foot Survey Carried on in the Pasadena Schools This Year, Claire Colestock, Assistant Director of Physical Education in the Pasadena City Schools.
Utilization of Swimming Technics in the Corrective Program, Edith Lindsay, Assistant Professor of Physical Education, Mills College, California.
Posture Correction Through the Dance, Margaret Jewell, Instructor in Physical Education, San Jose State College, San Jose, California.
Demonstration of dance technics by students from San Jose State College.

7:00 P.M. Banquet.
Speaker, Dr. Frederic P. Woellner of the University of California at Los Angeles on the topic *Mental Maturation.*

Wednesday, July 1st

8:00 A.M. Orthopedic Hospital.
Surgical Clinic *Fascial Transplants,* Charles LeRoy Lowman, M.D.
Attendance will be limited to thirty. Tickets may be obtained during registration.

10:00 A.M. Little Theatre, Ambassador Hotel.
Evolution of Muscular Physiology, Steele F. Stewart, M.D., Los Angeles.

11:00 A.M. *The Use of Physiotherapy in Pediatrics,* William M. Happ, M.D., Los Angeles.

2:00 P.M. *Symposium on Mental Hygiene.* Presentation of case studies by physical therapists.
Ruth Aust, Denver.
Hazel Furscott, San Francisco.
Frieda Gassin, Washington, D. C.
Dorothy Graves, Los Angeles.
Normal and Abnormal Mental Mechanisms, James Houloose, M.D., Long Beach Public Schools.
7:30 P.M. Trip to the Movie Studios.

Thursday, July 2nd
Little Theatre, Ambassador Hotel.
9:00 A.M. Business Meeting.
1:30 P.M. Trip to the Huntington Library in Pasadena.

Friday, July 3rd
The following clinics and hospitals will be prepared to welcome you:
Los Angeles General Hospital.
Children's Hospital and School.
Orthopedic Hospital and School.
Good Hope Clinic.
Good Samaritan Hospital.
Hermosa Beach Rest Home.

Catherine Worthingham,
Program Committee.

Vacation and Convention

Now is the time to begin your vacation budget. Naturally you want the best vacation it is possible for you to have; inexpensive as well as interesting and entertaining. Combine them all and come to the Convention in Los Angeles, June 28 to July 2. During the summer the railroad rates are less. Take advantage of them and travel.

The Southern California Chapter is looking forward to greeting you June 28. Everything possible will be done to make your stay in Los Angeles a pleasant one.

Plans have been made by the hospitals and clinics listed in the program to welcome you on July 3.

Exhibits

Mrs. Broemser reports that many applications for space in the scientific exhibit have come in, but that she hasn't heard from all the chapters. Remember the exhibits may be individual, chapter or institutional. The exhibits are a very important part of our convention. *Chapter Presidents* check and see that your chapter is represented by at least one exhibit. Send word to Mrs. Berenice E. Broemser, 824¾ N. Las Palmas, Los Angeles, to save the amount of space that will be necessary for your exhibit.

The exhibits will be open every day during the convention so there will be ample time to view both the scientific and the commercial exhibits.

Hotel Reservations

When you make your hotel reservations at the Ambassador Hotel, please make them in the name of the American Physiotherapy Association, as it makes a difference in the expenses of the convention.

The hotel rates are as follows:

Double room and bath	$3.50 each
Single room and bath	5.00 each
Two connecting rooms with bath between (3)	3.50 each
For four persons	3.00 each
Single room without bath	3.50 each
Double room without bath	2.50 each

Who's Who on the Convention Program

RODNEY ATSATT, M.D., M.A., F.A.C.S.

Member, American Academy of Orthopedic Surgeons.

Member, California State Medical Association Committee on Physical Therapy.

Orthopedic Surgeon—Santa Barbara Clinic, Santa Barbara, California.

Director of Physical Therapy Department, Cottage and St. Francis Hospitals.

One of his chief interests has been in research leading to the development of fever therapy.

FRANCIS BAKER, M.D.

Graduate, University of California School of Medicine.

Dr. Baker is the only woman orthopaedist in San Francisco.

Director of Physical Therapy Department, University of California Clinic.

MISS CLAIRE COLESTOCK, A.B.

Assistant Director of Physical Education, Pasadena City Schools.

Carried on foot survey in Pasadena schools this year.

Collaborated with Dr. Charles LeRoy Lowman in compiling for publication the book, *Corrective Physical Education for Groups.*

LYMAN CAVANAUGH, M.D.

Santa Barbara—private practice in endocrinology, clinical research in growth and development of children.

Co-author of *Hypophyseal Infantilism, Metabolic Factors in Osteochondritis,* numerous studies in osseous development.

ROBERT L. CARROLL, M.D.

Graduate, University of Pennsylvania.

Orthopedic Fellow, Cleveland Clinic and Los Angeles Orthopedic Hospital.

Director, Research and Records, Los Angeles Orthopedic Hospital and Clinic.

WILLIAM M. HAPP, M.D.

Graduate of Johns Hopkins. Specialist in Pediatrics.

Assistant Professor in Pediatrics, University of Southern California.

In charge of Nursery School, University of Southern California.

On staff of: Children's Hospital, Methodist

Hospital, and Cedars of Lebanon Hospital all of Los Angeles, California.

JAMES HOULOOSE, M.D.

Superintendent, Health Service Department, Long Beach Public Schools.

Instructor, Men's Hygiene, Long Beach Junior College.

On Los Angeles Lunacy Commission.

Teaches—University of California at Los Angeles Extension Division; University of Southern California Summer Session, The Methods of Teaching the Effects of Alcohol and Narcotics; Seaside Hospital, Long Beach, Nursing the Mental Patient.

MARGARET ELAINE JEWELL, Ph.M.

B.S.E. at University of Arkansas, 1927.

Ph.M. at University of Wisconsin, 1931.

Attended Cornish School, Seattle; New York Wigman School of the Dance, 1933; Mills College, summers of 1934-35. Studied with Hanya Holm, Director of New York Wigman School.

Instructor, Physical Education, San Jose State College, California.

SVEN RICHARD LOKRANTZ, M.D.

Graduate of Numan's School of Swedish Gymnasium, Stockholm; College of Preceptors, London, and Tufts College Medical School, Boston.

Director, Health Service Section, Los Angeles City Schools.

Dr. Lokrantz is a pioneer and internationally known leader in the field of corrective physical education which is a part of the city schools health service program.

CHARLES LEROY LOWMAN, M.D., F.A.C.S., F.A.O.A.

Chief of Staff, Orthopedic Hospital, Los Angeles.

Attending Senior Staff, California Lutheran Hospital, Los Angeles.

Attending Medical Staff, Methodist Hospital, Los Angeles.

Lecturer, University of Southern California.

Honorary Member, Mexican Athenaeum of Science and Arts.

Author of several books and numerous articles.

STEELE FULLER STEWART, M.D.

Graduate of University of Pennsylvania.

Surgery and Orthopedics, Peter Bent Brigham Hospital, Children's Hospital and Massachusetts General Hospital, Boston.

Instructor of Orthopedic Surgery, University of Southern California.

Assistant in Orthopedics, Children's Hospital, Los Angeles.

FREDERICK P. WOELLNER, Ph.D.

Received Doctor of Philosophy from Columbia University.

Member of California Academy of Social Sciences, The American Academy of Political Science, The National Education Association, California Teachers' Association, California Mental Hygiene Association, and Fellow of The National Geographic Society.

He has had many articles and books published including:

Highlands of the Mind

History as a Factor in Americanization.

Dr. Woellner is Associate Professor of Education at the University of California at Los Angeles and is a well known and popular lecturer in Southern California.

Convention Headquarters

CLIFFORD A. WRIGHT, M.D.

Graduated, University of Southern California Medical School.

Dr. Wright specializes in endocrinology and is associated with endocrine clinics at the Los Angeles General Hospital and Los Angeles Orthopedic Hospital. He is Associate Professor of clinical medicine at the College of Medical Evangelists, Los Angeles, and special lecturer on endocrinology at the University of Southern California Dental College.

Author of numerous articles on various endocrine conditions.

Ticket—Southern

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Treasurer—Cecelia Leverone, Brighton, Mass.
Secretary—Edith Monro, Boston, Mass.

Members of the Western New York Chapter were able to carry out, during the past winter, a long hoped for educational program.

The Buffalo group has enjoyed a course of ten lectures on anatomy, with dissection, at the Buffalo Medical School. Dr. Roy Atwell, Professor of Anatomy, conducted the course.

The Rochester group is benefiting by a similar course conducted by Dr. R. Plato Schwartz, Professor of Orthopedics, University of Rochester Medical School. Our work is being confined to a thorough study of the foot, leading up to an explanation of Dr. Schwartz's research work in developing electrobasographic records of human gait as described in his article in the last issue of the PHYSIOTHERAPY REVIEW.

We are greatly indebted to Dr. Atwell and Dr. Schwartz.

Helen Foss, formerly of St. Paul, Minnesota, has been associated with the Crippled Children's Guild in Buffalo for the past year. Western New York Chapter welcomed her with open arms. We feel especially privileged to have with us a former national officer.

The pendulum has swung back on us, though, for in December Mary Nesbitt left Rochester for the West Coast. We speeded her on her way with a distinct sense of loss. Her new work takes her to the Physical Therapy Department of the University of California Hospital in San Francisco. She was a valuable member of our chapter and we miss her. Treat her well, Northern California Chapter!

Mrs. Eleanor B. Peck, formerly of Boston, a member of the Massachusetts Chapter, is now living in Buffalo. She transferred her membership to Western New York Chapter promptly and without waiting to be looked up. We are so glad to have her.

Error

We call attention to an error in the article by Dr. R. Plato Schwartz in the March-April issue of 1936. On page 49, the second paragraph, the second from last sentence should read, "Measures should and must be provided to prevent the inward rotation, namely, the *valgus* position, of the heel."

In the March-April issue of 1936, in the book review on page 76, *New Pathways to Children with Cerebral Palsy*, by Gladys Gage Rogers and Leah Thomas, the publisher's name was omitted. The book was published by MacMillan, New York.

ABSTRACTS

John S. Coulter, M. D.

Facial Erysipelas

Evaluation and Comparison of Specific Antiserum and Ultra-Violet Therapy

H. Jerry Lavender, M. D., and Leon Goldman, M. D., Cincinnati, in Jour. A. M. A., 105:6:401, Aug. 10, 1935.

In the serum series (thirty-two cases) the same make of a standard and uniform preparation of specific serums was used throughout. All injections were made intramuscularly and at twenty-four hour intervals. The white count gave a mean value of 15,000. An average of 4.8 injections per patient was administered. The febrile period gave an average of 6.6 days. An interesting observation was made between this febrile period (6.6 days) for intramuscular injections of the serum in comparison with the series in 1924, with 3.9 days (early cases) and 5.4 days (entire series), following antistreptococcus serum when given intravenously.

In the ultraviolet series (twenty-six cases) quartz mercury burners of a standard make were employed. These tests were made several times weekly to determine as closely as possible the factors governing the erythema dose of the burners. The white blood count gave the same average (15,000) as the serum cases. These patients received an average of three exposures (given approximately twenty-four hours apart) to and slightly beyond the involved area or areas, each area receiving a total of fifty-seven erythema doses, or an average of 18.8 erythema doses per treatment.

The vast majority of the patients showed a decided improvement within twenty-four hours after the first exposure. Inflammation was lessened, edema was reduced, and areas appeared darker in color and were much drier where excessive vesiculation had been manifested previously. There was at the same time a reduction in fever, in most cases a drop of from 2 to 3 degrees, accompanied by an improvement in the general condition. In fact, it was interesting to note the relative absence of pain or any marked discomfort following the exposure to ultraviolet rays.

If the temperature remained down, no further ultraviolet therapy was administered. If no appreciable drop was noted in twenty-four hours, or if the temperature again began to rise, a second treatment was instituted, and so on. Our patients with an initial average fever of 103.7 F. had a febrile course, averaging 4.9 days, in comparison with those of the serum patients with 6.6 days.

It should be pointed out, however, that the ultraviolet cases were treated on the average of twelve hours earlier than those of the serum series. It was only after the patient remained afebrile for at least twenty-four hours that a 5 per cent ointment of boric acid was applied to the treated areas in order to soften them and to hold the scaling and crusting to a minimum.

Of our total series of ninety cases, it was interesting to note that only five gave a history of previous attacks of erysipelas, these with an average of two attacks. There were seven deaths in our total series, or about 6 per cent.

It must be emphasized that there are many variables in making comparisons of any nature, and especially is that true of the treatment of facial erysipelas. The seasonal incidence, the lapse of time before the onset of treatment, the general condition or debilitation of the patient and previous treatment are just a few of the matters that play a marked role in the evaluation of the therapy instituted.

We believe that, if all these factors are considered, one should not be so confused in evaluating the effect of various types of therapy, and, therefore, we do not agree with the statement that "the duration of the disease is so variable that it is very hard to judge the effects of therapy."

That ultraviolet therapy is equal if not superior to serum therapy is, we feel, very evident. Aside from the economic issue, which is an important one (cost of serums), the end results, governed by the quicker response to treatment and the fewer complications, make ultraviolet therapy for facial erysipelas quite distinctive, and, indeed, the method of choice.

Conclusions

In all, ninety cases of adult facial erysipelas were observed from 1933 through the spring of 1935.

Thirty-two of these cases were treated with specific antiserums with an average of 4.8 injections.

Twenty-six patients were given intensive ultraviolet therapy with an average of 18.8 erythema doses at a treatment and an average of three treatments for each patient.

Thirty-two cases were used as controls with simple wet dressings.

A critical analysis of the data showed ultraviolet rays to be the therapy preferred.

Physiotherapy in the Treatment of Injuries in General and Orthopaedic Practice

E. B. M. Vance, M. B., Ch. M. Sydney, M. Ch. Orth. Liverp., Honorary Orthopaedic Surgeon, Royal South Sydney Hospital; Honorary Assistant Orthopaedic Surgeon, Royal Prince Alfred Hospital, Sydney; in British M. J., No. 3914, Jan. 11, 1936, page 53.

As a disciple of Thomas, I believe in the restoring of parts impaired by injury by three methods. (1) A period of rest: in adequate splints, uninterrupted, enforced and prolonged until the inflammatory process of repair is nearly complete. This process involves the vascular capillarized granulation tissue being slowly converted into avascular scar tissue—and, in the case of bone, for lime to be deposited in the scar tissue—a process taking typically three weeks, but in bones and joints longer. (2) A period of tentative use as a test of recovery. (3) By gradually increasing natural use of the part and the gradual discarding of the splint.

The ideal case requires nothing but adequate rest followed by gradually increasing active motion. The ideal case is the thing to aim at. It takes for granted an ideal surgeon and an ideal patient. The ideal patient is a man of mettle, one who eagerly desires to return to

work, or, alternately, one who has to work. The ideal patient is not one who is put into the cotton-wool of sympathy or on workers' compensation. For instance, the woman of 60 with a Colles fracture, surrounded by a family of grown-up children who won't let her do a hand's turn, is not in the position to be an ideal patient. The ideal surgeon is still harder to find.

To send every injured person to the massage department with a note asking for "hot air and massage" is comparable to sending every sick patient to the dispensary with a note asking for a bottle of medicine. Either we know the powers and limitations of physical therapy, and are prepared to prescribe precisely what physical therapy the patient needs, or we know nothing of it and should not be using it. For example "effleurage for twenty minutes daily for a week," or "assisted active movements of shoulder girdle twice weekly for three weeks," or "exercise to strengthen foot inverters once a week with home work," constitute to my mind the sort of prescription which should come with the patient to the masseur. To ask for physical therapy is more logical. Here one definitely hands over the case to a second person, and calls upon her to use the varied resources of her art at her discretion. This requires her having full particulars of the nature of the injury, or the operation performed, and if she be very wise, very well trained or very well used to our own methods the scheme may work. It might be objected that the routine "hot air and massage" method seems to work in practice. The reason for this is that most cases are cured by nature while the patient is kept amused by the treatment.

For recent trauma, massage, in my opinion, plays a useful part, both in sprains, fractures, dislocations, and septic compound wounds. In a recent sprain early massage—effleurage and petrissage—will expel the exudate around the torn ligament, and this is followed by the application of a pad and bandage. Early use of the limb is the next step, but though the use should involve all the adjacent joints, the affected ligament should be, by strapping, bandaging, or, for example, wedging one of the shoes, protected against fresh re-straining. Sprains treated in this way do much better than in the more common plaster-of-paris immobilization, which gives rise to the formation of painful adhesions from the undispelled exudate.

In fractures early effleurage to the site of fracture is of the greatest comfort, and very useful. Under the influence of gentle, caressing stroking the muscles relax and lose their spasm, and the exudate—even a large hematoma—will palpably diminish in size and tenseness with twenty minutes' effleurage. After this, one proceeds to reduction, with or without anesthesia. In the splints, if one uses those of Thomas, there is always some bare flesh which is available for the gentle stroking, either as homework or at the hands of the masseuse. I do not ask or allow the masseuse to remove splints in the first three weeks of massage. I deem it my duty to do this. In dislocations early effleurage reduces the exudate and lessens the likelihood of future adhesions. Against these one takes the precaution of asking for a guarded, assisted active movement of the joint once a day in selected joints.

The part played by heat now comes for consideration, and here one is confronted with an endless array of methods and contrivances to reproduce and exploit that comfortable feeling which heat gives to the injured part.

It is handiest in the form of diathermy. This gives us penetration of heat into the tissues, and heat brings hyperaemia—which is favorable to callus formation in bone—and the absorption of excess exudate in the adjacent soft tissues, which form obstacles to muscle use later. One great advantage of it is that it can be given with the splints in position. You will no doubt hear from someone enthusiastic for diathermy a great deal more about its virtues and the cures it helps to effect in septic conditions of the hands, etc.

What are called "hot air machines" are appliances fitted with several incandescent lamps and metal reflectors, and provided with a thermometer. The air in the chamber becomes heated to 180 or 200 F., and the heat is very penetrating. A limb may be heated for fifteen to thirty minutes, but care is necessary to avoid overheating, especially in anesthetic areas.

The Bristow coil, which uses interrupted high frequency faradic current, and is capable of producing painless muscle contractions in a most natural manner, demonstrates to this person that the muscle can still move, even without his will, and even, indeed, without his good will.

The latter is a most important point in dealing with the over-cautious laggard, who is as yet neither neuropath nor malingerer, but is capable of becoming either, according to how he is handled. This type of patient is common enough today among persons insured against accident. Having shown him the muscle movement, the next thing is to make his mental effort to move it coincide with the movement imparted by the machine, until he learns gradually how to do it for himself. The Smart machine is, I am informed, a recent improvement on the Bristow coil. Galvanic and faradic currents are brought into use, first, for testing purposes in peripheral nerve injuries, and secondly, for treatment of the same.

Passive movement is the most difficult and most dangerous of all physical therapeutic measures. The case in which it is used and does no harm would have got better with natural use or active exercises. In the case in which it is used unwisely it produces calamitous results. Should it not be removed from physical therapy and put into surgery? It calls for the greatest certainty of diagnosis before it can be used. The pitfall consists in removing the not yet sufficiently recovered articulation (which Thomas's test of recovery would have enabled us to detect).

In active motion lies the sap of the matter of physical therapy. It is only active motion that restores function to a part. Active motion calls for voluntary effort. No massage, no heat, and no machines can, from the outside, bring back active motion. That is why the post-war temples of physical therapy collapsed, and that is why it is unnecessary to spend much money on elaborate equipment. The secret is, it is muscles that matter. Bones and joints exist only as the servants of muscle. Life itself is only expressed by motion, and muscles produce motion.

When a limb is injured in any but the most trivial way there is some affection, some wasting of muscles. There may be direct muscle injury, or interference with its blood supply or with its innervation. The wasting may be a reflex from some remote injury or from disuse alone. But whatever the cause these wasted muscles have less strength and respond more slowly to impulses than their less wasted fellows. The skill of the physical therapist is here required to get the least possible interruption of function while repair is taking place. The splint imposes certain restrictions, but all movements not restricted by the splints should be encouraged. The earlier function is resumed the better the chance of complete recovery.

Let us compare the results in Colles's fracture. In one case the fracture has been treated in a splint coming well up on the palm, and the patient has had no advice or incentive to move the fingers. The other has had splints applied to the forearm (but leaving the hand free), and has been told to peel a potato on the fifth day. Five to nine months is the period of disability of the former, as many weeks that of the latter.

The principles of muscle re-education are the same for traumatic cases as they are for poliomyelitis. It is only a question of amount and degree. There is the posturing by a splint, to favour the weak muscle and check the action of its antagonist; there is the giving the muscle a minimal task; and there is the gradual daily increment of work. It demands an intimate acquaintance with each and every muscle and its action.

For all but the ideal patient, occupational therapy has a definite and large part to play. Its importance in industrial accident and workers' compensation cases cannot be over-estimated. It is the post-war application of the war-time lesson of the "curative workshop." Even the best of us is the better for objective work during convalescence from an injury, something to throw the interest from the hurt limb (which interest has been maintained by splinting, exercises and what not) into some outside object, in the making of which the hurt limb has to be used—however clumsily. Raffia work, clay modeling, rug making, chair caning, leather work, wood carving, and book binding, to name but a few on the list, are avenues which open up interest, demand bilateral manipulation (a great help), and hold the interest by the joy of creation.

Non-Operative Treatment of Peripheral Vascular Diseases

Mont R. Reid, M. D., and Louis G. Herrmann, M. D., Cincinnati, Ohio; (From the Department of Surgery of the College of Medicine of the University of Cincinnati and of the Cincinnati General Hospital). In. Ann. Surg., 102:3:321, September, 1935.

Classification of Peripheral Vascular Diseases

A.—Primary Vasomotor Disturbances

a. Vasoconstrictor disturbances

(1) Raynaud's Disease

(2) Acrocyanosis (acro-asphyxia chronica; acroparesthesia; sclerodactylia)

b. Vasodilatory disturbances

(1) Erythromelalgia

(2) Acute painful osteoporesis (?)

B.—Primary Organic Diseases of the Arteries

a. Traumatic (chemical and thermal)

(1) Embolism and simple thrombosis

(2) Arteriovenous aneurysm

(3) Phenol and all caustics

(4) Frost bite

b. Inflammatory (toxic)

(1) Thrombo angiitis obliterans

(2) Specific arteritis (syphilis, tuberculosis, periarteritis nodosa pyogenic)

(3) Nonspecific arteritis (exanthemata, typhus, typhoid, pneumonia)

(4) Nonspecific arteritis (chronic toxemia, ergotism

(5) Endarteritis obliterans (cause undetermined)

c. Degenerative changes.

(1) Arteriosclerosis (senile, diabetic and Monckeberg)

We have made extensive use of intermittent negative and positive environmental pressures (Passive Vascular Exercises) in the treatment of the acute pain and threatened or actual gangrene due to peripheral vascular diseases. These exercises have been used in conjunction with other general measures which are appended.

General Directions for Home Care of the Feet Ambulatory Treatment

Wash feet each night with neutral (face) soap and warm water.

Dry feet with a soft clean rag without rubbing the skin.

Apply rubbing alcohol (70 per cent) and allow the feet to dry thoroughly, then apply a liberal amount of vaseline or toilet lanolin and gently massage the skin of the feet.

Always keep your feet warm. Use woolen socks or wool lined shoes in winter and white cotton socks in warm weather. Use a clean pair of socks each day.

Use loose fitting bed socks instead of hot water bottles, electric heaters or any other form of mechanical heating devices.

Wear properly fitting shoes and be particularly careful that they are not too tight. Use shoes made of soft leather and without box toes.

Cut your toe nails only in very good light and only after your feet have been cleansed thoroughly. Cut the toe nails straight across.

Do not cut your corns or calluses.

Do not wear circular garters.

Do not sit with your legs crossed.

Do not use strong antiseptic drugs on your feet. Particularly never use tincture of iodine, lysol, cresol or carbolic acid.

Go to your doctor at the first signs of a blister, infection of the toes, ingrowing toe nail or trouble with bunions, corns, or calluses.

Drink at least four quarts of water each day.

Eat plenty of green vegetables and fruit in an otherwise well-balanced, liberal diet, unless you have been ordered to follow some special regimen.

Do not use tobacco in any form.

Have some member of your family examine your feet at least once each week.

Carry out your exercises prescribed by your doctor exactly as you were taught to do them in the clinic. Do them regularly and faithfully.

Come to the clinic for Passive Vascular Exercise treatments as directed.

Hospital Routine for Patients with Peripheral Vascular Disturbances

Bed should be fitted with a Balkan frame with hand grips to aid patients in carrying out exercises and permit patients to move around in bed easily.

Affected extremity or extremities should be placed on a pillow in the position which affords optimum circulation to the part. Heels should extend over the edge of the pillow to prevent excessive pressure from the mattress.

Position of optimum circulation as determined in the Vascular Clinic,

(A)—Right foot,

(a) Recumbent position . . .

(b) Sitting position . . .

(B)—Left foot,

(a) Recumbent position . . .

(b) Sitting position . . .

Large, doubly insulated cradle over the legs and feet, when necessary to relieve pressure of bed covers. Cradle should not be fitted with electric bulbs or other mechanical heating device, but the legs kept warm with

large woolen or flannel stockings, or by keeping the room warm.

Well-balanced liberal diet.

Drink at least four quarts of water each day.

Patients should abstain from the use of tobacco in any form.

Daily cleansing of the feet. Careful application of neutral (face) soap and warm water followed by alcohol (70 per cent). Dry feet without friction. Apply vaseline or bland oils to roughened or irritated areas. Special care should be given to the toe-nails and thick calluses.

Ulcerated areas on the extremities should be specially treated.

Use only non-habit-forming drugs for the relief of pain in the extremities.

Postural treatments as advised by Buerger and modified by Allen should be carried out as directed.

Passive Vascular Exercise treatments as directed.

All diabetic patients are simultaneously under the care of the Medical and Surgical Services.

The temperature of the patient's room should be kept at 80 F. or slightly higher and no fluctuations of the temperature should be permitted during examinations, treatments or dressings.

All important clinical studies on the patients with peripheral vascular disturbances should be made in the Vascular Clinic of the Dispensary.

Our experiences in treating these acute crises of peripheral vascular accidents have been for us the most thrilling observations in our clinic for many years. In every instance of acute major arterial obliteration in which there has not occurred obvious death of tissues we have been able to relieve the spasm and draw blood into the extremity in an astonishingly short time with quick relief of pain and the prevention of gangrene. This has been accomplished even when sensation in the extremity has been absent or markedly diminished. When "Pavaex" treatments were started a striking case was that of a woman 37 years of age with transient auricular fibrillation associated with mitral stenosis. Treatment was begun five hours after an embolus had lodged at the bifurcation of the right common iliac artery. The pain in her leg, which was agonizing and not relieved by large doses of morphia, was completely relieved within fifteen minutes by passive vascular exercises and the color of the leg was changed from an ivory white to that of an active hyperemia. After a few days another embolus lodged in the left popliteal artery and the subsequent circulatory deficiency in the leg was relieved in less than five minutes. During the next two weeks the "Pavaex" treatments which at first were given at intervals of 60 minutes for periods of 30 minutes were gradually diminished in frequency until only five treatments of one hour were given each day. Three weeks after the first accident all treatments were discontinued and she has continued to be well since February 1934. Pedal pulses have returned in the left foot but there is no palpable pulse in the entire right thigh or leg. The arterial circulation is adequate in both lower extremities. Operative procedures of either embolectomy or lumbar ganglionectomy have been avoided. The dangers of subsequent thrombosis and continued neurocirculatory imbalance would certainly have continued after embolectomy. This case is typical of many other experiences we have had with cases of arterial embolism, peripheral aneurysms and sudden traumatic interruption of the major arteries.

The value of "Pavaex" therapy diminishes as we approach the other extreme of peripheral vascular disturbances where occlusion of the arterioles occurs unassociated with sudden increases in the pathologic process and consequently uncomplicated by vasospasm or neurocirculatory imbalances.

Osteoarthritis and Its Concomitants

By R. G. Gordon, M. D. D. Sc., F. R. C. P. Ed., Physician to the Royal United Hospital, Bath, and to the Bath and Wessex Orthopaedic Hospital; in British M. J., No. 3909, December 7, 1935, page 1083.

Osteo-arthritis is such a common disease that we are apt to take it for granted that we know all about it, and so fail to expend on the individual case that careful thought and unbiased consideration which the Hippocratic tradition demands of us. This state of affairs is made all the worse in view of the fact that osteo-arthritis is usually included under the general heading of rheumatic diseases, a curious medley when we consider that it is made to include such diverse entities as gout and rheumatoid arthritis, osteo-arthritis and acute rheumatism.

Pathology

The essential of osteo-arthritis is a defective circulation in the joint, and the result of this is that the centre of the cartilage begins to degenerate, becoming thinned and ridged (fibrillation of cartilage). Then the margins of the cartilage show proliferation and irregular lipping, and excrescences may form. These may become ossified and the outgrowths may become detached, so that loose bodies escape into the joint cavity. The synovial membrane may show signs of inflammatory reaction, but this is never so intense as in the rheumatoid joint, nor does proliferation occur with a pannus creeping over the cartilaginous surface. The bone, as has been said, shows areas of degeneration often cystic in appearance, and compensatory osteophytes develop, while surfaces exposed by erosion of cartilages eventually become hard and shiny (eburnation). The capsule and ligaments are at first fibrosed, but in late stages may disintegrate and disappear. This leads to marked deformity of the joints, since the muscles may form new and unusual bony attachments and pull the bones out of position.

Local Treatment

The local treatment must be directed to increasing circulatory efficiency in the joint, relieving pain, and reducing muscular spasm.

At one time protein shock, which by its pyrexial effect "shook up" the circulation, had a vogue in the treatment of osteo-arthritis, and often for the time being produced favorable results.

Of more direct benefit is the local application of heat by means of diathermy, radiant heat and hot douches, which latter, incidentally, should be given for their thermal rather than for their percussion effect, and consequently should not be too violent, since anything like trauma to the joint is to be avoided at all costs.

In a condition which is in many cases largely due to major or minor trauma, anything like forcible manipulation can have no place, although careful passive movement, especially if carried out in hot water such as can be provided by the large pool bath, may be of great service. For the same reason many of the surgical operations proposed for the relief of osteo-arthritis have proved disappointing or even harmful. The enthusiastic surgeon must remember that the osteo-arthritic patient is often too elderly and arteriosclerotic, and so a bad subject for prolonged and extensive operations which involve much shock. If one hip only is involved arthrodesis (if it can be brought off) is far the most satisfactory operative pro-

cedure, but sometimes the unhealthy bone refuses to unite, while in other cases the other hip rapidly becomes as bad as was the first, and a double arthrodesis is not practical politics. In a recent paper Mr. McMurray advocates the relatively simple Lorenz operation, and there seems to be much to commend it.

Splinting may give much relief and effectually prevent further destruction of the joint, and for hip and knee cases a well-fitting walking calliper is of great service. It is, however, often difficult to persuade the conservatively minded and short-tempered old lady or gentleman to harness themselves with this piece of damned ironmongery."

I believe that the theory that fibrositis is dependent on infective foci has been much overstated. I do not wish to suggest that such foci should not be sought for, or that when they can be removed without too much consequent disturbance of the patient that they should not be extirpated for the benefit both of the osteo-arthritis and of the fibrositis. I do believe that they may be directly responsible for fibrositic reactions, and also that the whole metabolic balance may be upset by such foci, but in other cases the metabolism may be deranged and fibrositis initiated as a result of entirely different causes. It is true that inflammatory reactions of the synovial membrane are met with in osteo-arthritis, and these may indicate a secondary low-grade infection, but such reactions are not nearly so constant or obvious as in the rheumatoid type of arthritis. Hence, in osteo-arthritis and in the fibrositis of elderly people I would most strongly deprecate the wholesale clearing of a mouth without due care and consideration, and I cannot say that I have been much impressed by the ultimate results of removal of tonsils in persons over thirty-five as a means of cure for either of these conditions. With regard to fibrositis I believe that in the majority of cases of fibrositis in middle-aged and elderly people the fault is primarily metabolic, and that this is specially the case in muscular fibrositis.

It will be seen, therefore, that the same sort of bodily condition as is apt to be associated with osteo-arthritis may form the soil on which fibrositis is grafted. Moreover, the two disease processes play into each other's hands. The muscles round a joint which is the seat of disease are required to act as splints. This involves increased tone, increased strain, decreased mobility, and decreased circulatory efficiency, all of which promote the development of fibrositis. With the fibrositic involvement the muscles become less efficient and tire more easily. As a result the splint from time to time gives way, and so the joint is subjected to minor but recurrent traumata, with a resultant intensification of the osteo-arthritis. This vicious circle may continue till all the muscles round the joint are affected both by the increasing fibrositis and by the increasing spasm. It is true that the greater the postural tone of the muscle the more efficiently will it act as a splint; but increased tone soon passes into spasm, and the decrease of its efficiency arising from the resultant and accompanying fibrositis means that postural tone has got to be bolstered up by fibrositis, and this may lead in the end to severe contractures and deformities. As has already been said, the spasms and contractures themselves are responsible for a great deal of pain, and if these have not been prevented in the early stages division of such contracted muscles, as, for example, in the adductors of the hips, may give enormous relief and restoration of mobility to the joint even in late cases, at least for the time being.

Fibrositis may be recognized by the presence of "nodules." These are hard nodes or bands which can be felt against subjacent bone when the muscle is relaxed. The examining finger requires a certain amount of education to detect these, but once the physician really recognizes the feel of them there is little or no difficulty. The nodules may or may not be tender, and if not tender they are potential, if not an actual source of distress to the patient. In the cases under discussion, however, the nodules are usually exquisitely tender, and the patient will squirm and contract his muscle when they are pressed, and will often complain of pain referred down the distribution of an adjacent nerve trunk.

The objects to be aimed at in the direct treatment of fibrositis—that is, irrespective of promoting general health or removing septic foci with due precautions—are three-fold:

1. To break down the fibrous nodules and liberate the imprisoned toxin.
2. To promote local and general circulatory efficiency so that these toxins may be cleared from the muscles and fibrous tissue and conveyed to the excretory organs.
3. To encourage elimination, especially by the skin and kidneys.

The first object can, I believe, only be efficiently attained by massage, but just any massage will not do. The masseuse must first of all have trained her fingers to discover the nodules in the muscles. She must then have learned how to manipulate them against subjacent bone so as to rub them away, and she can only do this if she knows how to get the particular muscle which she is treating properly relaxed. She must realize that at any rate at the beginning of treatment this massage is painful for the patient, and so she must "temper the wind to the shorn lamb." At the same time she must persevere, and have the tact to make her patient persevere, because he will not get better until the nodules are removed. Neither the patient nor the physician should be unduly alarmed by the appearance of bruising as a result of the massage, since with the brittle condition of small vessels this may be inevitable if the breaking down of the nodules is efficiently carried out.

The massage may be given "wet" or "dry." Wet massage generally given by the Vichy method has the advantage that the continuous application of hot water in the form of a douche or rain helps to reduce muscular spasm and relieve pain. If, however, a really skilled masseuse is prepared to devote time, patience, perseverance and sympathy to her patient, I believe that dry massage is preferable, since more time and care can be given to locating and removing individual nodules.

The improvement in circulation is best brought about by the combined thermal and percussive action of hot douches applied locally to the muscles but not to the joints, while similar results may also be induced by radiant heat, diathermy, etc. Similar methods may be used to promote elimination by the skin, and, in my opinion, the deep pool bath with the undercurrent douche of water hotter than the main bath is the most generally useful treatment. Since this has been mentioned as a good rational treatment for osteo-arthritis it is doubly useful for the treatment of such patients as we are at present considering.

Conclusions

Osteo-arthritis is a degenerative disease occurring as a rule in elderly patients with failing circulation and elimination, and affecting joints previously damaged by strain, trauma, or disease.

The essential pathology is a degenerative change in the central cartilage leading to thinning, ribbing, and finally disappearance, with exposure of underlying bone. The bony changes consist of formation of exostosis and eburnation of exposed parts. The capsule and ligaments are at first fibrosed, but may eventually disappear, leading to new muscular attachment.

The pain in osteo-arthritis is due to pressure on exposed bone and muscular spasm.

Stiffness and limitation of movement are only occasionally due to exostoses and loose bodies, but generally due to fibrositis, muscle spasm, and fibrosis of the joint capsule.

Deformity is due to changes in bony architecture and to new attachments of muscles pulling the bones out of position.

Prognosis, though eventually bad, should not be too gloomy, since much can be done to stop or delay progress and to remove the concomitant fibrositis.

General treatment consists of measures to arrest cardiac, renal, and vascular degeneration, especially those which will dilate the capillary bed and promote elimination by skin, kidney and bowels.

Local treatment is directed to increasing circulatory efficiency of the joint, relieving pain, and reducing muscular spasm.

No trauma must be applied to the joint; therefore, manipulation must be carried out with the greatest care, and operative procedure is only applicable to carefully selected cases.

Splinting is often very useful, especially the walking calliper in hip and knee cases, if the patient can be persuaded to tolerate it.

Adjuvant treatment is chiefly directed to the accompanying fibrositis. In the elderly subjects of osteo-arthritis this will consist of the right kind of massage and eliminative methods, chiefly in the form of physical and hydro-therapeutic procedures.

Removal of septic foci will only have a secondary place, since both the osteo-arthritis and the fibrositis are chiefly due to metabolic changes consequent on vascular degeneration and faulty elimination.

Book Reviews

THE FOOT. By Norman C. Lake, M. D., M. S., D. Sc. (Lond.), F. R. C. S. (Eng.), Senior Surgeon and Lecturer on Surgery, Charing Cross Hospital, Surgeon Bolingbroke Hospital, Director of Studies, London Foot Hospital. Cloth. Price $4.50. *Pp.* 330 *with* 95 *illustrations. Baltimore, William Wood and Co.,* 1935.

Much industrial incapacity and social discomfort are caused by painful feet. The cause is frequently a comparatively trivial one, but the patients find that their complaints receive but little attention from their physicians. To some extent this is due to a lack of consideration of the common foot condition in our medical schools. The author states that it is with the object of remedying this defect that this book has been written.

There are short chapters on the significance of the evolution and development of the foot. There is an excellent chapter on footwear, giving its history and a discussion of present day footwear. Abnormalities, injuries and infections of the foot are well considered. There are chapters on hallux valgus, flat foot, hallux rigidus and flexus, hammer toe, verruca pedis, corns, affections of the nails, pes cavus, metatarsalgia, painful heels, chilblains, ulcers and other common conditions of the foot.

This volume deals with those conditions which are likely to come into the purview of the general practitioner and surgeon and the physical therapist. It does not deal with the major orthopedic procedures which can be studied elsewhere. It is recommended as a useful book to physical therapists who are required to treat diseases of the feet.

ESSENTIALS OF PSYCHOPATHOLOGY. By George W. Henry, Associate Professor of Psychiatry, Cornell University Medical School, New York. Cloth. Price $4.00, *Pp.* 312. *Baltimore: William Wood and Company.* 1935.

As stated in the author's preface this book was written primarily for medical students and members of the medical profession, but it should also be useful to any student of psychopathology. Those who deal with the invalid well recognize the need for better understanding of the personality of the patient regardless of the nature of his malady.

In the treatment of neuroses and psychoses, the physical therapist has a specific role in which to function. Nevertheless, some insight into the nature and causes of these personality disorders should help them in their contacts with mental patients. This book is not a text-book of psychiatry. It is rather an excellent supplement to such texts.

In the first chapter the contributions of heredity and environment to personality development are considered. This is followed by a discussion of the relationship of body constitution and the function of the brain to behavior. The next three chapters deal essentially with physiological aspects. The relation of physical disease to personality disorder is receiving more and more attention and special emphasis is being placed upon the proper evaluation of the human problems that are in the background of almost every case of disordered health. The effects of emotions upon bodily functions may be demonstrated both in the clinic and in the laboratory.

A chapter on "mental dynamisms" is especially excellent. The common devices which are employed to prevent or relieve internal conflict, such as sublimation, projection, etc., are clearly defined. The significance of maladjustments of childhood as a source of personality disorder in the adult is discussed in the following chapter.

The final chapters contain current psychological formulations, psychiatric case records and methods of examinations. The material is drawn primarily from the author's own clinical and laboratory experience.

The time spent in careful perusal of this small volume which treats so effectively the complex subject of psychopathology will be amply rewarded.

THE PSYCHOLOGY OF DEALING WITH PEOPLE. By Wendell White, Ph. D., Assistant Professor of Psychology, University of Minnesota. Cloth. Price $2.50. *Pp.* 252. *New York. The MacMillan Co.* 1936.

According to the author, this book is the first of a series of four volumes on the psychology of dealing with people. The concept that man has certain fundamental wants frequently called instincts, cravings, desires, motives or needs that constitute the prime movers of all his behavior is the underlying theme.

Each volume is to be devoted to a consideration of a distinctive want or urge. The present one is devoted

to the subject of dealing with people by appealing to the want for feeling of personal worth. It is well recognized that man is particularly prone to the feelings of inadequacy, insecurity and inferiority. The layman is well aware of the "inferiority complex" which annoys so many individuals in their business and social life. Consideration of this important psychological reaction of one's fellowman should enable one to achieve much more success and happiness in his dealings with people.

The reader will find in this small volume many common sense principles, with their psychologic connotations, amply illustrated and presented in simple language. The want for a feeling of personal worth is so essential that it behooves one to exercise some intelligent forethought in what he says or does in relation to those about him.

MECHANICS OF NORMAL AND PATHOLOGICAL LOCOMOTION IN MAN. By Arthur Steindler, M. D., F. A. C. S., Professor of Orthopedic Surgery, The State University of Iowa. Cloth. Price $8.00. *Pp.* 424 *with* 453 *illustrations. Springfield, Charles C. Thomas,* 1935.

This volume is a modern, basic survey presenting in a comprehensive manner human locomotion from the physical point of view. If offers a new method of introduction to and orientation in human locomotion.

The general laws of mechanics are considered as accepted. They serve as a standard by which human motion can be measured. The human locomotor events are special cases in the operation of a general law. Steindler does not try to formulate a general law by synthetizing or aggregating a number of observations on human motion, but attempts to prove the operation of an existing and recognized general law by biological events. For instance, there is accurate knowledge of the stress and strain resistance of beams and columns of a certain construction. The tendencies of human material to develop stress resistance approach unmistakably those which are found in constructed and calculated material. It is fully justified to deduce from these findings the operation of the mechanical law upon living material.

The author realized the probable sources of error of this theory because the operation of other laws (as well as those of mechanics), causes the response to the mechanical law never to reach perfection. For example, in the weight baring function of bone his observation shows that the predominance of the mechanical over other laws reaches a very high degree. Nevertheless, other biological laws, for instance, the law of epiphyseal bone growth may interfere with the strict mathematical parallelism between the construction of inert material and that of living tissue.

The investigative side of this subject is still in its infancy, and therefore it has been possible only to a limited extent to furnish physical interpretation for physiological or pathological events. However, the science of mechanics has an important place in physical education as well as in the surgery of the locomotor system.

THE RHEUMATIC DISEASES, THEIR RECOGNITION AND TREATMENT. By Francis Bach, M. A., M. D. (Oxford), Chief Assistant at St. Bartholomew's Hospital and the British Red Cross Society's Clinic for Rheumatism; Physician, St. John Clinic and Institute of Physical Medicine; Specialist in Rheumatic Diseases, St. Steven's Hospital (L. C. C.); Member Royal College of Physicians Committee on Chronic Rheumatic Diseases. Cloth. Price $5.00. *Pp.* 436 *with* 26 *text figures and* 12 *plates. London, Cassell and Co., Ltd.,* 1935.

Under the general term of rheumatic diseases is included such widely different conditions as rheumatic fever, lumbago, myalgia, sciatica and chronic joint conditions. To the patient, rheumatism usually means pain and stiffness; whereas to his doctor it indicates the presence of pathological processes of which he may or may not know the mechanism or the cause. This volume defines the rheumatic diseases and presents the criteria for their classification and diagnosis. This is done in such a way that the reader may, firstly, appreciate the presence of certain distinct varieties of these diseases, secondly, understand something of their natural history and recognize their clinical, radiographic, pathological and bateriological pictures, and thirdly, know the essential recognized methods of treatment with their relative purpose, value and limitation.

Where there is nothing new in the physical therapy which is outlined, the chapters detail all the methods used and usually give the technic of application. Under short wave diathermy, the author unfortunately makes the statements that short wave diathermy is claimed to produce biological and therapeutic effects which are dependent on wage length and not on the result of heat alone, and to exert a specific action on certain tissues. No mention is made of the work done to disapprove these theories.

It is a book that can be recommended as a reference book to physical therapists interested in the treatment of the chronic rheumatic diseases.

THE MODERN TREATMENT OF BURNS AND SCALDS. By Philip H. Mitchener, M. D., M. S. (Lond.), F. R. C. C. (Eng.), Surgeon and Lecturer in Surgery, St. Thomas Hospital, Hon. Surgeon to H. M. The King. Cloth. Price $2.00. *Pp.* 64 *with* 12 *illustrations. Baltimore, William Wood and Co.,* 1935.

This is a monograph on the author's method of the tannic acid treatment of burns and scalds. He believes that the tannic acid compress is a simple and satisfactory dressing for a first aid dressing and is equally applicable as a final dressing for burns. It is a book for first aid workers and has little interest for the physical therapist.

THE HAIR AND SCALP. By Agnes Savill, M. A., M. D. (Glasg.), M. R. C. P. I., Consulting Physician to Fitzroy Square Skin Hospital; Formerly Physician to St. John's Hospital for Skin Diseases, Leicester; to the Skin Department, South London Hospital for Women. Cloth. Price $5.00. *Pp.* 288 *with* 54 *illustrations. Baltimore, William Wood and Co.,* 1935.

The common diseases of the hair and scalp are believed by many, especially women, to belong to the domain of cosmetics. They consult the beauty parlor operators first and usually follow their treatment. These conditions should come within the sphere of the medical profession but the attitude of the public has some justification as few physicians show much sympathy with a woman who complains of scanty hair.

While there is nothing new or original about the observations presented, the value of this volume lies in the detailed consideration of the common diseases of the scalp and hair. These may seem of little importance to the medical profession, but to the patient they are far from trivial. There are four chapters on falling of hair. All the physical agents used in these conditions are considered. This volume is recommended to those physical therapists who are required to treat the diseases of the scalp and hair.